Science and Mathematics Education Centre

Systemic Sustainability Reporting in Educational Institutions: a comparative investigation into sustainability reporting on secondary science school websites in England

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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Abstract

There is increasing discussion on the issues of resource use and sustainability in society in general and in education in particular. The United Nations (UN) organisation and the United Kingdom (UK) government, similar to other Western Nations around the world (Australasian, European, North American), are engaging with sustainable development issues and the need for education to addressing the challenge this presents.

Increasingly, education institutions, corporations and non-governmental bodies are taking on the agenda of sustainability reporting. This is to meet legislative requirements, provide leadership, demonstrate commitment to transparency and address concerns for stakeholder accountability.

The issue of accountability and transparency in the operation of many educational institutions is under greater scrutiny and consideration. A major area for investigation and research is the increased use by institutions of the medium of the internet to function as an outlet for information reporting to stakeholders and interested parties.

This thesis investigates secondary school websites in England to review their sustainability activities in a systemic way and assess their level in terms of sustainability initiatives, including transparency and accountability to their constituent stakeholders. The research for this thesis focuses on the evaluation of sustainability reporting in UK secondary schools. There are a range of curricula areas that naturally connect with this agenda. Science specialist schools are of interest as the positivist Western science creates a driver to awareness, capacity for empiricism and ability to understand complex issues, which can inform debate and decisions on development for a sustainable future.

Through the disclosure framework of stakeholder theory, a content analysis of the publicly available information on school websites identifies to what extent there is evidence of an educational institution's sustainability through selected keywords. This is undertaken within a pragmatic framework to analyse the reporting regimes of secondary schools with specialist science status. The study elucidates to what extent sustainability issues are systemically incorporated, discussed and disclosed publically in the secondary education sector utilising the medium of the web-based internet.

A range of exemplary schools are provided as comparative examples for discussion of the effectiveness of the science specialist schools. This is within the context of the recent and ongoing changes in the state school sector in the UK. The sample of specialist science schools in England, were assessed for positive association with the keyword parameters to analyse improved performance when compared to a control group and the secondary education population as a whole in England. The conclusion, based on results from the analysis of the data, and the literature, indicates that there is an increased opportunity to make improvements to the current reporting of sustainability initiatives and school activities.

Selected changes to the internet-based web facility to improve engagement with stakeholders would include sustainability of schools in a more systemic way with the financial, operational, educational and performance achievements which are currently disclosed. Information presented on the web increases valued connections to provide transparency, accountability and improved availability that may have other beneficial effects for the school stakeholders, the local community and beyond. Further research would also benefit policy makers and stakeholders through an integrated sustainability reporting format that encompasses educational activities, outcomes and operations of a school, providing the basis for systematically using a web interface to provide improved disclosure and accountability.

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Abbreviations

AASHE	Association for the Advancement of Sustainability in Higher Education
ACARA	Australian Curriculum, Assessment and Reporting Authority
BRE	Building Research Establishment
BREEAM	Building Research Establishment Environmental Assessment Method
BSF	Building Schools for the Future
CCL	Climate Change Levy
CFR	Consistent Financial Reporting
CLG	Communities and Local Government
CRC	Carbon Reduction Commitment Energy Efficiency Scheme
CSR	Corporate Sustainability/Social Reporting
DCFS	Department for Children, Families and Schools
DCLG	Department of Communities and Local Government
DfE	Department for Education
Defra	Department for Environment, Food and Rural Affairs
DEC	Display Energy Certificate
DECC	Department of Energy and Climate Change
DESD	Decade of Education for Sustainable Development
DfES	Department for Education and Skills
EC	European Commission
EE	Environmental Education
EfS	Education for Sustainability
EiS	Education in Sustainability
EMS	Environmental Management Scheme
EMAS	Eco-Management and Audit Scheme
EPBD	Energy Performance Buildings Directive
ESD	Education for Sustainable Development
ESG	Environmental and Social Governance
ESL	English as a Second Language
ESP	Eco-Schools Programme
EU	European Union
FEE	Foundation for Environmental Education
FSM	Free School Meals

GHG	Greenhouse Gas Emissions
GEI	Green Economy Initiative
GO	Government Organisations
GRI	Global Reporting Initiative
GUI	Graphical User Interface
HCA	Homes and Communities Agency
HMI	Her Majesty's Inspectorate
HSE	Health and Safety Executive
ICT	Information and Communication Technology
IDS	Institute of Development Studies
IIRC	International Integrated Reporting Committee
IISD	International Institute for Sustainable Development
IFA	Integrated Financial Accounting
IFC	International Finance Corporation
IPCC	Intergovernmental Panel on Climate Change
IR	Integrated Reporting
KBT	Keep Britain Tidy
LA	Local Authority
LEA	Local Education Authority
NCSL	National College for School Leadership
NGO	Non-Government Agencies
NZ	New Zealand - Aotearoa
OECD	Organisation for Economic and Cultural Development
Ofsted	The Office for Standards in Education, Children's Services and Skills
PISA	Programme for International Student Assessment
QCA	Qualifications Curriculum Authority
RSA	Royal Society for the encouragement of Arts Manufactures and Commerce
SEAM	Schools Environmental Assessment Method
SEEd	Sustainability and Environmental Education
SIEnA	Solent Industry and Environment Association – Southampton Environment Centre
SSP	Specialist Schools Programme
SSE	Systemic Sustainability in Education
SSS	Secondary Science Schools
STARS	Sustainability Tracking, Assessment and Rating System
STEM	Science Technology Engineering and Mathematics

TES	Times Educational Supplement
TNS	The Natural Step
UK	United Kingdom
UN	United Nations
UNC	University North Carolina
UNCED	United Nations Conference on Environment and Development
UNCSD	United Nations Conference on Sustainable Development
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational Social and Cultural Organisation
UN RCE EM	United Nations Regional Centre for Excellence East Midlands
USA	United States of America
WCED	World Council for Environment and Development
WWW	World Wide Web

Chapter 1 Overview

1 Introduction

> SIEnA ...approached the concept of sustainability in schools from the viewpoint that schools too are run as businesses and will face many of the same issues. However, it is a sector which may not have received sufficient attention from policy makers at national, regional and local levels. (Solent Industry and Environment Association Southampton Environment Centre 2001, p.i)

Sustainable schools as a concept, has a history associated over many years covering issues of providing sustainable societies in general and an ecological perspective on the discourse in education in particular. There is an ethical and moral imperative for sustainability in education and environmental reporting in institutions to be integrated in a systemic way (Sterling 2010).

The concept of sustainability and the definition of sustainable development have gained international prominence through discussion and negotiation, based on an understanding of the need for new initiatives to provide guidance for future generations. Much of this discourse was initiated with the publishing in 1987 of *Our Common Future* through the United Nations World Commission on Environment and Development (WCED) (World Commission on Environment and Development 1987). This was commonly known as the Brundtland report and became a standard definition from which many debates and initiatives have been generated (Imran, Alam et al. 2011).

Since the Brundtland report, the General Assembly of the United Nations made a declaration in 2002 for a Decade of Education for Sustainable Development (DESD) from 2005 – 2014 (United Nations 2002). This declaration has generated increased effort directed towards addressing sustainability issues and increasing the level of awareness in teaching and learning.

Sustainability and schools have a long tradition in the international arena. Campaigns have been initiated in educational institutions and throughout other areas of society focusing on Educating for Sustainability (EfS) for future generations (United Nations

Educational Scientific and Cultural Organisation 2012). The concept of EfS and creating progress towards sustainable schools has become a topic of discussion and action over the past decades (Solent Industry and Environment Association Southampton Environment Centre 2001, Scott 2010, United Nations Educational Scientific and Cultural Organisation 2012).

The United Nations Conference on Sustainable Development (UNCSD), popularly known as Rio+20, has countries internationally signing up to commit to the Sustainable Practices of Higher Education Institutions Initiative (United Nations Educational Scientific and Cultural Organisation 2012). These commitments are the sort of initiative that it is argued in this thesis that could equally be applicable to filter through to education at all levels. Further details of this initiative are given in Appendix A.

It is also mentioned by an international study group, that the awareness of sustainability in England has increased in the political and public sectors, especially in educational institutions (Anglo-German Foundation for the Study of Industrial Society 2009). Moreover, as global climate change becomes a bigger issue, there will be major effects on natural resources and peoples' lifestyles throughout the world (Intergovernmental Panel on Climate Change 2012).

Together, people will need to overcome these challenges with improved education and understanding of the issues. It is noted that to get people together requires effective communication strategies: "We have the potential to educate the entire public about what is actually going on in the world, but we aren't doing it...." (Ehrlich, Kareiva et al. 2012, p.68).

The increased prominence and dominance of the internet and websites, as a resource, has allowed people everywhere to gain insight and knowledge on how almost any institution or organisation is operating (Miniwatts Marketing Group 2012). There is increased pressure for institutions and businesses to make available more information and show transparency in their operations and the ethos of businesses, especially including sustainability requirements (Department for Environment Food and Rural Affairs 2012).

The outcome of these efforts has also been under investigation to define the measures that would be justifiable and workable, as has been noted (University North Carolina 2005, Petrini and Pozzebon 2009, Bell and Morse 2012). Today, most educational

institutions are also becoming more accountable for their actions in every way; from the safety and learning of their staff and students, the travel and procurement, sourcing of food and community involvement, and the construction and operation of their buildings (Department for Education and Skills 2006, Department for Education 2012). In the UK, the government requires schools to be accountable to the public as they are noted to provide an 'important public service' (The Children Schools and Families Committee 2010).

The management of an educational institution has become important on the basis of the efficacy and efficiency and also on the level of sustainability that can be incorporated into the whole school in a systematic way (United Nations Educational Scientific and Cultural Organisation 2012).

This overview and the context presented for the research, has outlined the necessity and the significance of the study and the contribution to knowledge. The structure and outlines for the rest of the chapters are presented below.

1.1 Background to the Research and the Researcher

The author's early interests focussed on education and the environment with a desire to understand earth systems, water cycles, atmospheric changes, ocean cycles (Carson 1951), geomorphology and land-use changes (Park 1995). This combination of systems and cycles with a new awareness of the literature describing the Earth as an 'entity' with a homeostatic system, led to an interest in the Gaia hypothesis (Lovelock 1979, Russell 1985).

The work of Schumacher (1973) introduced ideas and understanding on resource use and sustainability where production was based on consuming the natural capital of the earth. Another insight that had an effect on understanding the concept of sustainability was the work of Ekins and Neef (Ekins 1992). The discourse on the four capitals model for sustainable development provided a framework to understand how changes could be made in systems of production to improve the allocation and use of resources. This also provided a framework of understanding how humans interacted within the environment and the effect that had, and influenced present day activities and options for future generations. The four capitals are shown in more detail in Appendix B.

The research for this study had been arrived at through firstly noting the influence and the impact that information technology and computers were having on education and the environment. Further readings, discussion and thoughts were focused on the effect that computing, and its outreach via the internet and the world-wide web, have had on the education system and the nascent move to incorporate more environmental education into schools (Solent Industry and Environment Association Southampton Environment Centre 2001, Department for Education and Skills 2007, Symons 2008).

The use of systems theory to help shape the research became important from discussions with colleagues, attending conferences and discourse in the literature (Regional Centere of Expertise East Midlands 2007, National College for School Leadership 2011, Center for Ecoliteracy 2012). It became apparent that an holistic, systematic approach, taking the whole-school concept as a system, would be more able to capture the complexity and scope of the research. Systems thinking for sustainability 'made sense' to acknowledge and understand what was going on in one system (a school) and how it could be assessed in its interaction and output with other systems (the local community).

As this system concept was developed, the need for a robust approach for reporting and engaging in the issues of environment and sustainability became more apparent. A pragmatic approach with the framework of stakeholder theory for describing the actions of corporate organisations has been researched and adopted to guide the study and content analysis provided a basis for the data collection and analysis. The application of stakeholder theory is utilised from the corporate world and applied as a framework to the organisational actions of educational institutions (Jenkins 2010).

The research now had a theoretical underpinning and framework to operate in, and tools to investigate the scope and reach of sustainability information presented by schools. The research questions that arose were developed from a range of factors, including the material disseminated, its format and its accessibility to the public.

The study also focussed on what access was available through the internet, the World-Wide Web (WWW), other media formats, and the level of sustainability information on educational institutions. Also the study noted to what extent there was utilisation of a whole-school systems approach towards curriculum, campus and community (Department for Children Schools and Families 2008).

1.2 Overview of the Research

Reporting on the state of the planet has been in action for many years with the Global Environment Outlook (GEO), a process integrating environmental assessments and reporting on the state of the environment in and around the world. There is importance in the interaction of science and policy to inform decision making for management and development of the environment (United Nations Environment Programme 2012). Also, the work of the IPCC has provided a wealth of information utilised by the scientific community and the population as a whole (Intergovernmental Panel on Climate Change 2012).

Increasingly industry, businesses and companies are under greater scrutiny and increased legislative requirements to meet environmental standards. Successive UK governments have variously vowed to "put the environment at the heart of policy-making", (Solent Industry and Environment Association Southampton Environment Centre 2001, The Conservative Party 2010). A range of institutions are encouraged to become sustainable in their operation and physical environment, be they educational, business or government (Department for Environment Food and Rural Affairs 2012, People and Planet 2012, United Nations 2012).

Schools are a major user of energy and other resources, and are a large sector of the LA portfolio of buildings and estates with an important input into the sustainability challenge of making the best use of our resources (Solent Industry and Environment Association Southampton Environment Centre 2001). For the Local Authorities (LA) in the UK, they are required to take account of their carbon emissions and follow reporting procedures to reduce their carbon footprint with the CRC Energy Efficiency Scheme[1] (CRC) (Department of Energy and Climate Change 2011).

The schools in the primary sector have historically been strong in providing a range of activities that include cross-curricula themes on the environment and sustainability (Moray House School of Education 2002). In the secondary sector there has been more pressure on the separate subject areas which inherently dismiss the interconnectedness required to study earth-based systems which operate in a sustainable manner (Winter 2007). However science education allows a link to be made in association with the effects of discoveries in the subject areas of biology, chemistry and physics.

[1] The efficiency scheme developed out of the Carbon Reduction Commitment

The use of sustainability reporting can act as an incentive and as publicity for the promotion of a 'green' agenda. For schools there are a range of curriculum areas that naturally connect with this agenda. The topic of science education is of interest to the research because so much of the observable environmental measures installed in some schools, such as rainwater meters and renewable technology, are linked to studies in science (Department for Children Schools and Families 2009).

There are also important linkages between the study of science and the sustainability agenda. It has been noted that there is a certain irony that children will learn about sustainability in schools, although the extent that the school demonstrates this is debatable (Solent Industry and Environment Association Southampton Environment Centre 2001).

This research study was undertaken to improve understanding of the opportunities for reporting sustainability in secondary schools through the exploration of websites and characteristics in exemplary schools. The research project analyses official and locally published resources to obtain measures of sustainability at selected educational institutions. The main focus is what the school reports about their achievements through publicly available material (newsletters, media items, website material, official reports, and LA information) and whether the specialism of science status for an institution affects the outcome.

The UK is the setting for the data collection and literature review due to the level of initiatives through the successive governments since the 1990's (Reid, Scott et al. 2002). Due to the devolved nature of the education system the analysis relates to the English secondary schools and is not necessarily representative of the other administrations of Wales, Northern Ireland and Scotland.

This focus on the sector of secondary schools was important as there had been a major initiative of funding to rebuild and upgrade these schools. This has required a large investment of several billions of pounds of public money; spent on the construction with refurbishment, rebuild or new build, to generate more effective and efficient schools through the Building Schools for the Future (BSF) programme (Department for Education 2010). An additional driver was the government legislation[2] for all public

[2] In response to the European Union Energy Performance of Buildings Directive the UK government introduced Display Energy Certificates for public buildings over 1,000m2 from the 1 October 2008.

buildings to have a certificate showing their relative energy efficiency with a publicly presented Display Energy Certificate (DEC) (Communities and Local Government 2008).

The ability of secondary schools to obtain special science status, which provided additional funding for them, was also an opportunity to see to what extent this gave them any advantage (in the level of sustainability achieved) and was this information readily available publicly and via the internet (Department for Children Schools and Families 2009). Additionally, secondary schools are gaining academy status which influences their funding, management and reporting arrangements (Department for Education 2012, Gove 2012).

The analysis of the content of the publicly available information is designed to identify to what extent there is a clear effect or correlation between the level of output of keywords or phrases and the measures of an educational institution's sustainability. The use of the technique of content analysis is seen as an effective tool to analyse sustainability information from websites (Jose and Lee 2007). This is undertaken within the scenario of schools with science status and the 2004 national rebuilding programme for sustainable secondary schools BSF programme in the UK (Department for Children Schools and Families 2009).

1.2.1 Scope of the Research

This thesis investigates and analyses the data from a selected group of secondary schools in England, based on their status as specialist science schools. In this investigation the data is gathered from a range of information which is displayed on the school websites and is publically available. The data is collected and collated using content-based analysis techniques. The data is generated through an analysis of their website presence. The material is seen as related to the sustainability performance of the institution and is selected for analysis based on the use of keywords linked to the operation and activities of the school.

This thesis utilises the systems and stakeholder theories and ideas on sustainability, implementing a range of measures to integrate a broad and encompassing analysis of the publicly presented information from the educational institutions. The reporting regime concept is based on its utilisation in the corporate world, where Corporate Social Responsibility (CSR) and governance is becoming important in operational disclosures

(Bendell and Kearins 2005). This is considered in relation to the demands of educational institutions at the secondary school level in England.

The range of resources encompassed by the study includes school websites, LA websites, government department websites and databases, Non-Governmental Organisations (NGOs) and other educational sites available to the public. The local authority has until recently had funding control and was delegated many powers in respect of the schools regulatory functions. They provide resources to meet the educational requirements of the school. However more schools have been encouraged to attain academy status which has funding sourced directly from central government budgets (Department for Education 2012). The implications of this are that there is a change in emphasis and requirement for reporting information on how a school is performing in many aspects of its operation (Graedel 2002).

The concept of systemic sustainability in education is also promoted and suggested as the next movement to inculcate a concept of earth-based systems. The issue of what is the norm for schools and what can be seen as the level for reporting to normalise sustainability into the curriculum, campus and community of the schools. In this situation humans are aware of the deep dependence as well as interacting in the eco-system services for their benefit, they are also realising the consequences of this interaction (Sterling 2010).

1.3 Aims and Objectives

It is noted by Murcia, that it is the science that, “contributes to the informed decisions needed for future development and lifestyles to be sustainable” (Murcia 2009, p.1).

Similarly, it has also been argued by Tytler and Symington (2006) that science needs to reflect on the way it operates in the community. It is necessary to consider how science operates within the context of the economy, the political sphere and society in general.

In this thesis the hypothesis is that specialist science schools in England, through improved science education will provide a more developed literacy than other secondary schools in sustainability. This is based on the premise that these schools will have overt ‘measures’ of sustainability, identified through their curriculum, campus and community attributes.

The focus of the study is to ascertain from the collected data; are schools reporting; how are they reporting; and what is reported of their sustainability outcomes? The aim is to investigate the public disclosure on sustainability issues by schools and how this compares to other indices, through the medium of the internet, and the presence of the school website resources. This investigation associates sustainability with reported information and compares schools with special science status against a control scenario of 'Ambassador'[3], green Eco-Schools and exemplars based on educational reports from the school inspectors (Ofsted 2008).

A further aim is to present a range of initiatives, based on the findings for improved Integrated Reporting (IR) of schools (as noted in Chapter 3). This would be intended to show accountability, transparency and sustainability as part of improvements towards reaching international standards for socially responsible reporting which is integrated with sustainability outcomes (Bendell 2005, Gjølberg 2009).

One objective is to define a range of measures or criteria that are applicable to systemically encompass what a school reports about its sustainability achievements, or ethos. Further objectives are to analyse this data and to provide a comparative analysis of the efficaciousness of the status of science specialisms; to ascertain to what extent they are a contributor to sustainability objectives in the context of education for sustainable development and sustainability awareness.

The focus and line of inquiry for this study has led to the development of four research questions. These are based on the areas of science education, current reporting regimes and measures of sustainability using keywords on school websites. The data, analysis and discussion are based around the following questions:

Q1 How do science schools compare to other secondary schools in their attainment level?

Q2 To what extent do science schools compare to exemplars of sustainable schools in terms of the measures of sustainability?

These first two questions (above) are derived from the literature in Chapter 2, based on the use of public information and selected exemplar schools. The following two questions are derived from the literature in Chapter 3, with the areas of statutory reporting noted and the use of selected keywords for content analysis of the websites.

[3] The Eco-Schools programme awards Ambassador status to schools which have completed a series of sustainability levels.

Q3 To what extent can the school's statutory reporting act as a proxy for sustainability measures?

Q4 To what extent are the keywords which characterise sustainability in schools evident on the selected school websites?

The questions for this study specifically target science specialism schools for evidence of sustainability through reporting via websites.

1.4 The Research Topic

Educating for sustainability is increasingly seen as important to ensure sustainability for future generations. While the subject of education and sustainability is becoming increasingly analysed in educational discourse, there are many versions proffered of what is required and the form the education will take (Solent Industry and Environment Association Southampton Environment Centre 2001, Symons 2008, Scott 2010, Sterling 2010).

There is also a range of organisations which promote the use of Environmental Education (EE), Education for Sustainability (EfS), Education in Sustainability (EiS) and Education for Sustainable Development (ESD) (United Nations 2002, Groundwork 2012, United Nations Educational Scientific and Cultural Organisation 2012).

The definition of these different terms and the extent they are favoured over another is outside the scope of this research although a useful review and analysis is provided by Sterling (2010). The term learning for sustainability is a general phrase that incorporates sustainability education, which is referred to as Education for Sustainable Development (ESD), in England and Sustainable Development Education (SDE) is also a term used (Scott 2010).

This study is important to acknowledge the transparency and accountability of school disclosure of their sustainability activities and the use of sustainability teaching programmes. Many of these programmes in schools are cited in the literature as necessary to equip future generations with the knowledge and skills to live more sustainably and deal with the challenges of a changing world and the uncertainty that brings as resources are depleted and natural systems are endangered (Symons 2008, Cassell and Nelson 2010, Sterling 2010).

At present there appears to be limited research work that has systematically analysed what schools are achieving in their educational environment in terms of sustainability (Symons 2008). More schools are implementing a range of renewable technologies and water saving devices that may be connected with data for science education purposes. However it is not evident that they are showing how successful they are in implementing sustainability at different levels throughout the operation of a school. It has also been noted that few secondary schools are seen to engage successfully in sustainability issues (Symons 2008, Ofsted 2009).

Schools use the material mandated by the National Curriculum (in England and Wales) yet there is little knowledge of what gains the schools themselves are achieving, or 'practising what is preached' in the area of sustainability. Also, important in this context is the influence on student behaviour towards energy, water and other sustainability issues (Groundwork 2009). There is also range of initiatives concerned with Eco-Schools, Sustainable Schools and similar schemes that are mainly based on an environmental policy or an assessment of procedures such as the Eco-Management and Audit Scheme, (EMAS) (Department for Children Schools and Families 2008, Groundwork East Midlands 2011, Eco-Schools 2012).

The Office for Standards in Education, Children's Services and Skills (Ofsted)[4], regulates and inspects educational institutions for learners of all ages. Over many years they have reported on the issue of sustainability as part of a pilot project (Ofsted 2009). There are reports completed by Ofsted, the school inspectors, which identifies progress that schools are making to become sustainable (Ofsted 2009). The research identified in the academic literature has analysed schools' achievements against some measures of sustainability (Birney and Reed 2009), however the emphasis of the research undertaken in this study is the reporting by schools of sustainability issues, activities and related information on their websites.

Over the years there have been a series of reports referring to schools on different sustainability issues; these have included surveys and reports from Ofsted (2003, 2005, 2008, 2012), National College for School Leadership (2008, 2009, 2011), Sustainable Development Commission (2006), and Solent Industry and Environment Association Southampton Environment Centre (2001).

[4] Ofsted was originally the Office for Standards in Education (OFSTED) until it took on a range of other regulatory services.

Moreover, there appears to be a need to identify the range of measures that are currently utilised within the schools and integrate these towards an indicator of a 'sustainable school' (Anglo-German Foundation for the Study of Industrial Society 2009). There has been debate on the use of indicators for basic scientific and research interests and in one strand of this debate it is noted:

What can we really know about education and sustainable development through indicators'? (Anglo-German Foundation for the Study of Industrial Society 2009,p.8).

While there is a range of forms utilised by Ofsted for schools to self-evaluate their sustainability achievements, these may not necessarily reflect the complete position adopted by the school. There are limits to the format which encompasses a set of issues in the school, which lack a whole school approach (Sustainability and Environmental Education 2009, Scott 2010).

More schools are implementing a range of renewable technologies and water saving devices that may be connected with the science curriculum by utilising the data available for educational purposes; but it is not evident that they are showing how successful they are in implementing sustainability at different levels throughout the operation of a school. One report (Ofsted 2008) suggests that sustainability in the majority of schools was inconsistent and not coordinated in a whole-school approach. However recently a school which has attained academy status, was showcased in a report (Ofsted 2012) that noted 'the success of an integrated whole-academy approach'.

Many schools cover the material required by the National Curriculum to meet the assessment requirements and achieve well in the attainment tests; yet there is little knowledge of what gains the schools themselves are achieving, the 'reality' or 'rhetoric' in the area of sustainability (Cha and Edmondson 2006).

There are initiatives aimed at schools to improve their efficiency and performance in all areas of their operation as educational institutions (Act On Energy 2012, Department for Education 2012). The Government at the time wanted all schools to be models of energy efficiency, renewable energy and water conservation, showcasing opportunities such as wind, solar and biomass energy, insulation, rainwater harvesting and grey-water recycling to all at the school (Department for Children Schools and Families 2009, Department for Education 2012). Science education is one of the main subjects for

noting these features and is an important and core subject area of the national curriculum.

1.4.1 The Research Problem

In the academic literature previous research work has analysed some of the issues schools report in their move towards sustainability and in using the 'doorways' and other frameworks for sustainability (Department for Children Schools and Families 2008, Scott 2010, Bell and Morse 2012). Moreover, there appears to be a need to identify the range of indicators that are currently available within the schools and integrate these towards a measure of a 'successful school' (Department for Children Schools and Families 2010).

Schools are encouraged through a range of schemes and programmes to implement a variety of renewable energy systems and other technologies. These systems can be related to the science curriculum by utilising the available data in lessons. It is not yet evident that the schools are able to successfully show they are implementing sustainability at different levels throughout their operation and activities (1010global 2010).

The gaps in knowledge that can be ascertained from the literature, as noted in Chapters 2 and 3, identified several areas for the research to follow. While the literature addressed sustainability issues, the reporting concepts and website presence had a lack of literature addressing these areas in terms of schools and their sustainability practices.

1.5 Science Education and Specialism Status

The secondary schools under investigation in this study had all applied for and been provided with additional funding to specialise in the subject of science since the 1990s. In the area of environmental awareness, the subject of science is seen as of importance within the school curriculum, alongside English and mathematics, as part of the National Curriculum in the UK (Littledyke 2008).

This was also noted by the then government department responsible for education that 'Science Colleges' create an environment which raises the quality of teaching and learning in science and mathematics and that this will lead to an improvement for the whole school (Department for Children Schools and Families 2009). This then builds on the government initiatives in sustainable schools and sustainability, and the aspiration to

be the ‘greenest government’, and reduce carbon emissions and ameliorate the effects of climate change (Department for Education 2012).

The concept of a sustainable school needs to encompass the notion that schools are in a position of using their current resources of land, buildings and people, and are able, like any other system, to reach equilibrium through inputs and outputs with the flow of energy, materials and people. It is argued by Cassell and Nelson (2010) that education in the science subjects could involve more holistic discovery and interpretation. The sustainability of systems is seen as inherent in their structure and processes, for any instability will result in an accommodating change to new forms, or a breakdown into different structures.

Sustainable development is linked formally to the curriculum in the UK through four statutory subjects: citizenship, geography, science, and design and technology (Department for Children Schools and Families 2009).

The area of interest is the extent that science status promotes and publicises; in respect of its effects on education in sustainability issues, the sustainability reporting of a school’s operations. The implementation of specialist science status to schools, provided additional resources and linkages to local businesses and initiatives that enabled their cooperation in the area of science. This is seen by many schools to be worthwhile to provide a point of difference and area of expertise by the school for their locality.

The Local Education Authorities (LEAs) are required to produce information on the financial operation of the school and the achievement of the school pupils in a range of areas. Generally this information is used to assess the overall performance of a school. There have been initiatives from Ofsted to assess schools in the area of sustainability and a framework has also been developed for schools to self-assess in sustainability areas (Ofsted 2008, Sustainability and Environmental Education 2009).

Reviewing the issues noted above, leads to the perspective that there are many good initiatives undertaken in schools. However, there is the need for clear monitoring, to give a valued assessment of their effect. Using a reporting system requires robust measures to analyse what may be appropriately applied to the education sector.

1.5.1 Science Education

Sustainable development is linked formally to the curriculum in the UK through four of the statutory subjects of the 'National Curriculum': citizenship, geography, science, and design and technology (Department for Education 2012). There is however issues noted where the curriculum policies are seen as rhetorical and ineffective in implementing sustainability into the schools, as required by successive governments (Winter 2007).

An Ofsted report in 2011 noted that to meet the government's target for schools to be sustainable by 2020, then a priority for all schools' improvement plans would be to incorporate sustainability; additionally, it adds that there is a need for a 'whole school approach to embed sustainability' (Ofsted 2009, Ofsted 2011). Ofsted also found that all the schools surveyed, displayed a wide range of positive consequences as a result of their engagement in sustainability activities and issues (Ofsted 2009).

Ofsted (2009) had also been making assessments of schools in the area of sustainability and more recently completed a study of the status of science education in schools from 2007-2010 (Ofsted 2011). Details of the study are related in the discussion of the data in Chapter 6. While there have been a range of sustainability initiatives undertaken in schools (as noted previously), there is a gap in the present knowledge of what to use as valid measures or indicators (Tytler and Symington 2006), (Tilbury and Janousek 2005).

1.6 Significance and contribution to knowledge

On the national and international level there is much debate about the need for improved sustainability of resources and the teaching of sustainability issues (Symons 2008, Te Kete Ipurangi 2012). This thesis furthers the debate by analysing and interpreting the level of public presentation of this subject area in educational institutions based on a pragmatic framework and applying stakeholder theory to the need for reporting by schools to their stakeholders. There is also an analysis of what may be appropriate for the educational institutions and how this could be applicable to the stakeholders to increase accountability and transparency, using the medium of the web and website presence.

The use of stakeholder theory is developed from the arena of the business community and discussed as an appropriate framework for the implementation of reporting in an educational situation. There is a movement in the UK and worldwide to attain a balance

in the use of natural resources and to promote education for sustainable outcomes. The trend to sustainable solutions and this movement demonstrates the importance of this particular research project.

The challenge of generating and utilising measures and indicators of sustainability has been discussed widely (University North Carolina 2005, Scott 2010, Bell and Morse 2012). The novel approach and significance of the investigation is the combination of the different tools with the measures used in sustainability education to gain insight into the reporting of the schools which have science status. This effect is noted in comparison to schools (also known as Eco-Schools, green schools, planet friendly and sustainable schools) recorded as environmentally active through the recognition of awards (Grant and Featherstone 2009).

The research output from this study is of significance for a range of areas in education, government and community initiatives, at the local, national and international level. The literature (Reid, Scott et al. 2002, Scott 2008, Sterling 2010) on schools reporting their sustainability performance is lacking evidence at all levels from building operations, student awareness, to management practices; and also how this can be reported to the stakeholders that are affected by the actions of the schools (Carbon Trust 2005, Sierra Club 2011).

The research engages with policy at the school level, with the school community of pupils and staff. Beyond the school boundary the research engages with officials at the local and national level in a range of different agencies and departments which deal with schools from the curriculum, campus and community spheres.

A further contribution to knowledge is based on the premise that the impact of systemic thinking will be improved through educational institutions indicating a real and considered effect on the education of the local and wider community. This would be guided by following the original doctrine of ‘curriculum, campus, community’ as noted earlier (Department for Children Schools and Families 2008). In this case, the community, through local interactions with the school, would take into account their actions, which would have a wider implication such as in transport, food, information technology and other procurement.

On an international level it can be used to provide a framework for other educational authorities and establishments to appraise their situation and within their own social and

political context assess the systemic sustainability approach to reporting outcomes. This may be beneficial to enhance the learning, awareness and future-proofing for the next generation of adults. The use of disclosure through website reporting of sustainability for schools is an important addition to the transparency and accountability of educational institutions world-wide.

1.7 Methodology

The purpose of this pragmatic approach to the investigation is to research the extent of sustainability reporting in educational institutions of science secondary schools. The central concept is to investigate science schools compared with exemplar schools for reporting sustainability initiatives, through keyword analysis.

In 2009 there were almost 3000 educational institutions which had gained specialist school status, with the specialisms ranging from the arts, humanities, and languages to engineering and technology. Of these 3000 secondary schools, there were less than one hundred achieving the single specialism of science (Department for Children Schools and Families 2009).

The assessment of the publicly available information relating to schools is provided by a range of institutions and third parties through reports and surveys. The data is collected using content analysis as qualitative material with keywords; and as quantitative information, where the number and type of environmental or sustainable activities are recorded from the schools' websites.

1.7.1 Data and Analysis

This data is selected from the websites, using keyword analysis of defined website content; providing sustainability related activities and operations in the schools. It represents a 'snapshot' of the school and the extent it is related to their sustainability. The keyword data characterises sustainability practice as implemented into schools' daily operations, educational awareness and their physical environment.

Using an integrative model allows linking the content analysis data with the additional resources compiled on the educational institutions. These are gathered from a range of other reports and databases, providing information on achievement, energy, awards etc that have been identified and verified from official and government agency sources.

The series of data analysis operations that have been undertaken, where firstly to identify the relevant content from the different media sources; then to align this with the selected keywords from the ‘nine topics’, eight ‘doorways’ and other sources as noted in section 2.3.3. The data analysis is shown in Chapter 5 and the options for further work and a follow-up analysis of the educational institutions are discussed in the final chapter.

1.8 Ethical and Research Issues

The issue of ethical research practice was addressed through the university policy and committee on this aspect. Due to the nature of the research study the ethical issues raised were seen to be minimal, provided due care with the application of the data was considered to be fair and reasonable. The information presented in this study is all obtained from publicly available sources and is freely accessible by anyone with access to the internet. This was a conscious decision to gather data without influencing its collection through a non-interventional approach to the schools. It is sometimes apparent that there can be issues that occur due to the nature of the material and its analysis that allows educational institutions to be ranked by a series of measures that would otherwise not be made public.

To safeguard against the possibility of misrepresenting schools, unfair comparisons, and breaching privacy, a level of care is taken in the use of the information, by maintaining anonymous reporting. Also due to changing circumstances, the data used in this study has been anomalised to the extent that no school is directly or easily recognisable from the research presented, except where publicly available case study material is provided. The university ethics approval process was followed and the procedures assessed and applied to the study to ensure the correct application of the recommendations.

Due to the timeframe of the research and the changes in government and policies, some of the measures noted here will have changed and thus will reflect a snapshot of the situation within schools at that time and not reflect any subsequent changes.

The data is analysed as part of a process, and the technique for analysing this data is part of the focus of the research. The study assesses the extent the sustainability of a school can be portrayed from a range of measures and based on the level of disclosure from the publically accessible and available web-based material which has no inherent ethical or moral issues associated with it.

There can be some issues with comparability of data which has been used to show trends or make a comparison. This can be due to discrepancies with information which is available from a range of sources and based on different timeframes. Overall the collection and analysis of the data has been based on resources, all of which are publicly available via the internet.

1.9 Structure of this thesis

The background to the research has been outlined in this chapter, and there is coverage of the context for the research followed by the scope and justification for the study. The significance of the research was outlined, with an overview of the thesis aims and objectives. Details of the data set are mentioned and finally some of the ethical and other operational issues that needed to be taken into account while conducting the study have been presented.

In Chapter 2 the initial research questions are noted after the relevant literature on systems, sustainability and schools is reviewed. In Chapter 3 there is a statement of the areas covered and the theories that are utilised in the study are presented. There are further questions derived from the literature based on the areas of reporting information and the use of websites Also in Chapter 3 there is an evaluation of the use of systems and sustainability measures with their application to schools. The information includes sustainability frameworks for schools and the changes in schools in the UK, especially England.

Chapter 3 also analyses the use of a range of sustainability reporting and management systems, and their application in the corporate world and how they can be translated across to educational institutions. There is analysis of the information on the trends in corporate use of reporting systems and their disclosure via websites.

The research design and the methods employed are discussed in Chapter 4 with the methodologies that are used to present and critically assess the material. Also in Chapter 4 there is presented the preferred methods that are utilised, and these are described in detail.

In Chapter 5 the results of the data are tabulated and their significance highlighted and presented in graphical format. There is an assessment of the level of sustainability in the selected schools and to what extent this can be generalised for other educational

institutions. The discussion of the data analysis is covered in Chapter 6 with notes on how this current knowledge influences the existing understanding of sustainable reporting in schools.

In Chapter 7 there is a summary, with conclusions and recommendations based on the analysis of the science status schools. A comparison of the exemplar schools and the sustainable schools and the utilisation of the eight ‘doorways’ and Eco-Schools model is discussed. The conclusion of the thesis is presented with the recommendations and applicability of the findings to a wider audience. There is also an indication of how the context of the findings can be expanded to a range of scenarios and stakeholder groups, based on the contribution to knowledge.

Finally, suggestions for additional research are provided with some further questions. This section also summarises the key local and international contributions of this study. It examines the implications of this work to theory, research and practice and the limitations of the present study.

In the following chapter there is an analysis of theories of systems, sustainability and schools, and the outline for the sustainability features and frameworks are presented.

Chapter 2 Literature Review One: Systems, Sustainability and Schools

2 Introduction

> We want to help our economy, our communities and the environment to grow and flourish in a sustainable way for the benefit of future generations. (Department for Environment Food and Rural Affairs 2012,para,4)

In this chapter the current research and literature on systems, sustainability and schools that underpins this investigation are presented and discussed. There are two research questions derived from the gaps in knowledge noted in the current research and they are designed to meet the needs of the objectives as provided, in the previous chapter, to enable the investigation.

From the ascendency of positivist scientific method, with the philosophers and scientists Bacon, Descartes, and Newton setting the stage for the scientific method; the dominant view developed that the world could be examined and reduced to its unique components (Jacob 1994). This concept was later disputed with a proposal that it is the interactions which comprise a system, and its function; this highlighted the oneness of the universe and focused on the relationships, and interdependencies that connect the different parts together (Heylighen 1992).

Throughout the world indigenous populations have held an affinity with the environment where they are part of the whole system, due to their direct links to specific regions and the effect it has on their lifestyle and future living. They are seen as stakeholders in an active and passive way as they are people with knowledge of balancing the use and preservation of natural environments and the available resources for their survival. There is a deep knowledge and understanding that has sustained their use of environmental resources. Indigenous people can offer insights into the sustainable management of diverse environments for human survival and have a role in the debate (United Nations Educational Scientific and Cultural Organisation 2012).

One example of the strong tradition on sustainability that has been developed are the Canadian Inuit. They have had a livelihood which is interwoven into their use of their

immediate environment and surroundings. In a recent presentation to the IPCC summit in Copenhagen it was noted that there is a case for educational institutions to include an Inuit approach to the curriculum (Bloom 2009).

In New Zealand (NZ - Aotearoa), the indigenous Māori hold on to a tradition where there is strong interdependence with the land and its environs. The concept of Kaitiakitanga (stewardship, guardianship) is an important part of their holistic view of the interconnectedness of humanity and the environment in its flora, fauna and earth forms; akin to all the living and non-living resources on the planet; the environment in which they exist, is their ancestry and their future (Roberts, Norman et al. 1995, Mathieu 2004).

The Māori traditions of Kaitiakitanga and reverence for the natural world are evoked by the Enviroschools programme in NZ which encourages elements of this tradition through implemented into the school curriculum (The Enviroschools Foundation 2012). These traditional values and the historical view from some indigenous cultures is a defined approach which is further from the old scientific revolution that came with the Enlightenment, and more in keeping with new scientific thinking which understands the interdependence and need for interdisciplinary knowledge to enquire and progress in the modern world with the current challenges (Israel 2001).

The need for an approach which encompasses the complexity and interactions which make up the living cycles and planetary systems which provide resources for humans, is an important consideration for present and future generations.

2.1 Systems Theory and Thinking

In this study, the use of systems theory and thinking is seen as crucial to the development of a cohesive view of sustainability and how these have been incorporated into education in schools, and the discourse on the importance of an integrated approach to sustainability.

Using systems theory and thinking is crucial to the development of a cohesive view of sustainability to apply to the study of sustainable schools. Systems theory and thinking helps to develop understanding and awareness of the interactions and interdependence that occurs within complex systems and their sub-systems. A state of homeostasis can

only be achieved when interactions, (bounded by limits) provide feedback and inputs as part of a process towards sustainability Allen (2012).

2.1.1 Systems Theory

Systems theory is the interdisciplinary and transdisciplinary field of study that encompasses the abstraction of an organisation or pattern recognition that can be applied to different levels or scales of interaction in the natural world and the human-constructed environment (Heylighen 1992).

Von Bertalanffy (1950) originally proposed, that since Descartes and the 'scientific method' there had been progress under two related assumptions. A system could be broken down into its individual components so that each component could be analysed as an independent entity, and the components could be added in a linear fashion to describe the totality of the system. Von Bertalanffy, who originally proposed general systems theory, stated that both assumptions were wrong (Walonick 1993).

Organisational and social systems must change in order to remain healthy. Both are open systems, and are sensitive to environmental changes. A change in the environment can have a profound impact on an open system. The overall health of an organisation is strongly linked with its ability to anticipate and adapt to environmental change. Furthermore, the health of the environment is related to the matter-energy transactions taking place in the social and organisational systems. A bilateral relationship exists between the environment and the components of all subsystems operating within the environment (Walonick 1993).

2.1.2 Systems Thinking

Systems thinking is an approach which views systems in a holistic manner. This analysis envisions and integrates the component parts of a system, which act differently when isolated from the system's environment or other parts of the system (Allen 2012).

In contrast to positivist and reductionist thinking on the world (Howe 2009), systems thinking is an approach to help develop our understanding and awareness of the associations and patterns that occur in any arrangement; whether it is the trees or the woods, the pupil or the school; the family or the community.

There is a need to change the systems approach to sustainability so that a better defined concept of systems thinking is developed. Porter and Cordoba (2009) use three broad approaches to systems thinking: functionalist, interpretive, and complex adaptive systems that relate to sustainability pedagogy.

Some further perceptions in systems thinking are noted by the Center for Ecoliteracy (2012), where it is noted that thinking systemically requires a shift in perception, which leads to different teaching and learning pedagogy as well as changes to the organisation of institutions and the society they operate in:

> Systems thinking is an essential part of schooling for sustainability. A systems approach helps young people understand the complexity of the world around them and encourages them to think in terms of relationships, connectedness, and context (Center for Ecoliteracy 2012,para.3).

The concept of systemic sustainability is the use of a systems approach to signify the need to look at all the actions and interactions that may influence the ability of a system to attain a sustainable equilibrium for existence.

2.1.3 Schools as Systems

Systemic sustainability is discussed as a measure of the degree of integration and the changes in the approach of the educational institution to normalise sustainability, based on analysis of the accumulated data. According to Laszlo and Laszlo (2011), the use of systemic sustainability as a process of development for the individual, organisation, or society, requires a strategy of emergence to ensure the maintenance of an increasingly robust and supportive environment.

Further, it has been noted by Laszlo and Laszlo (2011) that there are four stages or levels of intentional action required in the development of practices, before they become embedded in an institution. These are given in Table 2-1 below.

Table 2-1 *Four stages of intentional action*

(Laszlo and Laszlo 2011)

Levels of action	Characteristics of action
Personal or internal sustainability	where the individual listens in quiet contemplation of their intuition and empathy – this is seen as sustainability with oneself - bringing meaning to my life
Socio-cultural sustainability	where there is community or interpersonal sustainability, where people are involved in dialogue and collaboration, and coordinated action with collective wisdom - sustainability with others - sharing our vision
Ecological sustainability	where at this level the ecosystem or transpersonal sustainability is important to the individual - sustainability with nature - contributing to the regeneration of ecosystems
Evolutionary sustainability	addresses the need to become an integral part of living systems - sustainability with the flows of being and becoming - honouring our past and creating our future as an integral part of nature

The socio-cultural stage is most closely associated with the work of schools, through the curriculum subject of science. Other curriculum subjects can also be associated with the attribute of 'ecological sustainability'. The use of a systems approach to sustainability for schools provides a framework which is important for the encouragement of a whole-school initiative to use the curriculum, campus and involve the local community in sustainability concepts.

2.2 Current Review of Sustainability

Sustainability is the ability to continue or sustain the same activities for an infinite amount of time, and encompasses the concept of Kaitiakitanga (Roberts, Norman et al. 1995); or for Brundtland, development which meets the needs of current generations without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development 1987).

The UK government has been noted to define sustainable development as: social progress which recognises the needs of everyone; and effective protection of the environment; and prudent use of natural resources; and maintenance of high and stable

levels of economic growth and employment (Department for Environment Food and Rural Affairs 2012). These four objectives are required to be met in a simultaneous way in the UK and also throughout the world in a process towards sustainability (Higher Education Partnership for Sustainability 2003).

The UK government had since 1997 (Solent Industry and Environment Association Southampton Environment Centre 2001) proposed a range of initiatives to address the issue of education for sustainability, as educational institutions are required to become sustainable in their operation and physical environment (Department for Children Schools and Families 2009, Department for Children Schools and Families 2009).

For sustainability to be of value as a concept, then it needs to be defined in a context which has political input, linking sustainability to well-being, equality, and environmental integrity. Sustainability goals are therefore context-specific and inevitably contested, making public deliberation and negotiation essential (Leach 2010, para. 8).

The concept of sustainability has developed over the years with different models providing different interpretations and levels of understanding and analysis. In the three circles model (World Commission on Environment and Development 1987), each circle represents a sphere of activity or interaction. The overlapping of activities in the centre is seen as the area of common connection for sustainability as shown in Figure 2-1 below.

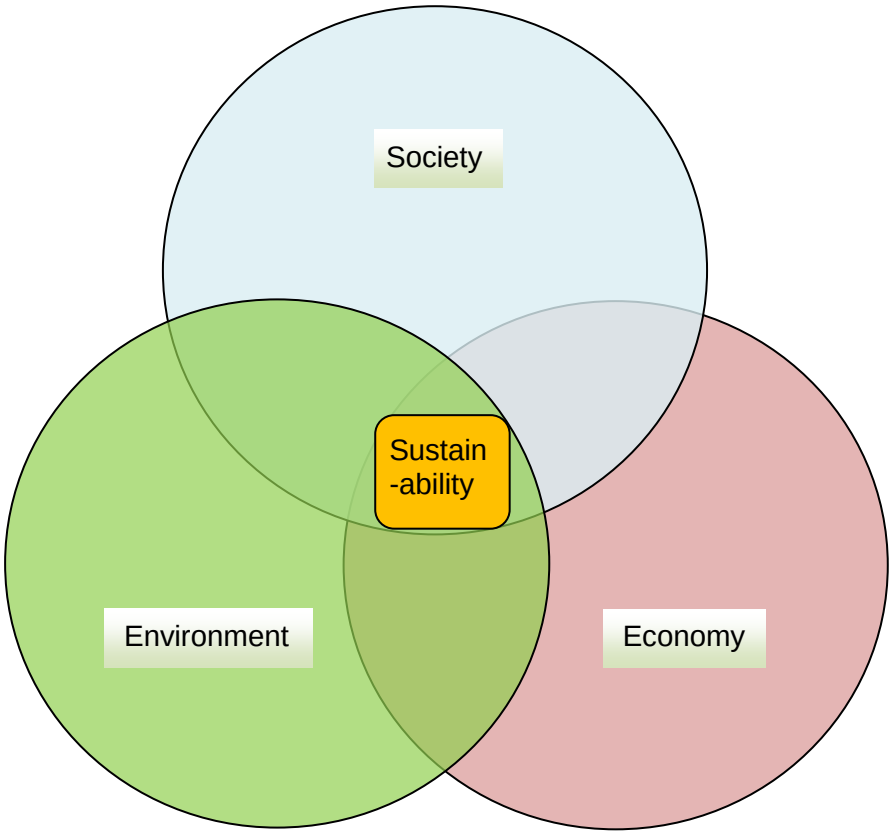

Figure 2-1 *Three circles model for sustainability*

(World Commission on Environment and Development 1987)

The three circles model shown in Figure 2-1, has been used as one of the most well-known versions to represent sustainable development for many years (World Commission on Environment and Development 1987). There is another model for sustainability, of nested circles (Figure 2-2), which indicates the relative position and importance of these components of sustainability. This has been adapted by the author to show the position and importance of sustainability as a concept. However there are many other diagrammatic versions representing the importance, relevance and integration of sustainability as has been shown in a recent book of these diagrams (Mann 2011).

The model shown in Figure 2-2 below is based on the concept of an environment that contains all that is available to humans as part of their society; and within that society there is a system of commercial economy. This economy of commerce is used to facilitate the society and its use of the natural resources and the natural system services. These services are provided by natural cycles to replenish the atmosphere,

water-bodies with precipitation, providing sinks for carbon and other gas emissions, liquid and solid wastes in the oceans, soil and forests etc (Costanza, d'Arge et al. 1997). There is a greater emphasis on integrated systems operating within an overall finite resource base. In current discourse, this can be exemplified as a more ecocentric interpretation of the place of humans in relation to the planet, compared to the human-based or anthropocentric view of our position in the world (Imran, Alam et al. 2011).

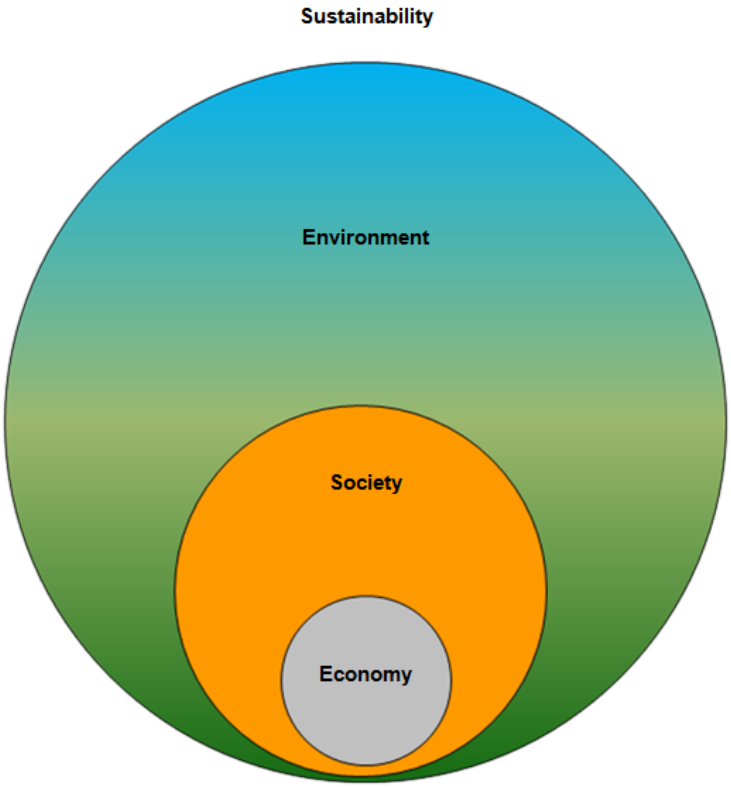

Figure 2-2 *Nested circles model for sustainability*

(Adapted by Author)

As noted previously, the scientific method may look at systems, and allows an examination of the environment in a particular way, while the analysis undertaken within a systems framework provides further insight, looking into the interactions and consequences of these connections. This is developed further in the rest of this chapter.

This analysis provides an overview of current education for sustainable development efforts in the UK and is a starting point for more in-depth research, particularly regarding quality and long-term outcomes for the Decade of Education for Sustainable Development (DESD) goals (United Nations Educational Scientific and Cultural Organisation 2012). These outcomes provide a baseline to measure progress in the UK on ESD and the DESD, and offers headline data on key themes that were considered by

stakeholders to be important areas for monitoring ESD in the UK (UK National Commission for UNESCO 2010).

These key areas may represent possible indicators for future monitoring and evaluation of ESD in accordance with the DESD. As has been noted in the UK (National Commission for UNESCO Report on ESD in the UK) (UK National Commission for UNESCO 2010) in 2010: this is an update of the 2008 report: A Survey of Action (UK National Commission for UNESCO 2010). However as stated in the literature (Imran, Alam et al. 2011), this definition has been seen as anthropocentric in its approach and does not allow for the environment as a whole to be considered to the same extent; in an eco-centric way.

The concept of systemic sustainability is the use of a system approach to signify the need to look at all the actions and interactions that may influence the ability of a system to attain a sustainable existence (Porter and Córdoba 2009). The Center for Ecoliteracy (2012) has noted that there is a requirement for a shift in perception to thinking systemically, and that different ways of teaching, and organising institutions and society, is required.

Sustainability has developed as a term from early environmental and ecological concerns, that had a resurgence in the 1970's with a range of publications including 'Limits to Growth' (Meadows, Meadows et al. 1972), and 'A Blueprint for Survival' (Goldsmith and Prescott-Allen 1972) which were published in advance of the first Environment Summit: the 1972 UN Conference on the Human Environment, in Stockholm.

Sustainability has also evolved from the concept of the planet Earth having natural capital[5] which needs to be cared for through the process of sustainable development. In that consideration is the concept of 'Four capitals' and 'Five capitals' for sustainability presented by Forum for the Future (1992), where these capitals include: Human capital, Natural capital, Social capital, Physical capital. Physical is further shown as Financial and Manufactured capital. Further details of the capitals concepts are given in Appendix B and E. The concepts and definitions of these capitals are presented and analysed further in section 2.3.5.

[5] Natural capital is explained further in Appendix B and E.

2.3 Sustainability Frameworks

Information on the performance standards of the buildings is one attribute that fits within the ‘doorways’ framework, noted below. Each institution can be compared against each other with some previous benchmarks as a guide to the baseline numbers, as provided by the government agencies.

Whole-school programmes such as 'Enviroschools' (Jackson 2009), 'Eco-Schools' and 'Green Schools' are all promoted to encourage the involvement and awareness of students and provide them with a range of resources to achieve these aims. They are mentioned by Henderson and Tilbury (2004) as part of their review of the sustainability initiatives around the world for educational establishments. In the UK the Eco-Schools Programme is provided through the agency, KeepBritainTidy, (KeepBritainTidy 2009), as part of an initiative to engage young people in greater awareness and action with regard to their environment.

The use of Eco-Schools and the extent of engagement are outlined in a later section. While there is increasing activity with some new initiatives there have also been changes in what is offered to schools, as the move has been to encourage greater uptake of academy status (see section 2.5.2 below). One casualty of the changes has been the demise of the BSF programme to improve the fabric and sustainability of secondary schools. The BSF initiative that was underway in the UK to rebuild secondary schools was a move to improve the sustainability of schools, as noted in 2004 with the former Prime Minister, who at the time spoke on sustainable schools, noting:

> There is a huge school building programme underway. All new schools and City Academies should be models for sustainable development: showing every child in the classroom and the playground how smart building and energy use can help tackle global warming.
>
> The government is now developing a school specific method of environmental assessment that will apply to all new school buildings. Sustainable development will not just be a subject in the classroom: it will be in its bricks and mortar and the way the school uses and even generates its own power.
>
> Our students won't just be told about sustainable development, they will see and work within it: a living, learning, place in which to explore what a

> sustainable lifestyle means. (Department for Education and Skills 2007, p.50)

There was also a move to involve schools in energy related assessments (Department for Children Schools and Families 2009) as well as the expectation from the government that all schools were to become 'sustainable schools':

> By 2020, the Government would like all schools to be models of energy efficiency, renewable energy use and water management. They should take the lead in their communities by showcasing wind, solar and bio-fuel energy, low-energy equipment, freshwater conservation, use of rainwater and other measures. (Ofsted 2008, p.17)

Government information can be seen as promoting the ideas of policy which has been promulgated by the party-driven ideology (Scott 2010). However it has been noted that there are some barriers to this expectation with the school buildings as they are important to successful education. Many school buildings are of poor design with an institutional look. To raise educational standards and improve attainment levels there is a need to make existing schools better and ensure that new school buildings are well built and of good design (Department for Children Schools and Families 2009).

2.3.1 The Natural Step

The Natural Step (TNS) framework for sustainability is derived from scientific studies which have been used to validate the concepts and provide coherence for the programme. Upham (2000) notes that the concept, where it promotes consensus on sustainability, is ambiguous, due to the notion of sustainability and its implications which are open to contention. TNS is based on system conditions where resource use must be fair and efficient while the removal and release of substances are deemed not to systematically increase in the ecosphere (Upham 2000). TNS is used as a rationale to identify sustainability principles that can be utilised to change perceptions in the public and business world, however its operationalisation involves value judgements (Upham 2000).

2.3.2 National Framework

The National Framework for the UK education curriculum provides the overall setting within which the devolved regions operate their educational programmes (Department

for Children Schools and Families 2008). As noted by the DCSF (2010) previously, schools want confident individuals, and responsible, caring citizens (Department for Children Schools and Families 2010).

This framework comprises the interlocking parts of a commitment to care; an integrated approach; and a selection of 'doorways' or sustainability themes.

A commitment to care: sustainable schools have a caring ethos; care for oneself, for each other (across cultures, distances and generations) and for the environment (far and near). Schools are already caring places, but a sustainable school extends this commitment into new areas. It cares about the energy and water it consumes, the waste it produces, the food it serves, the traffic it attracts, and the difficulties faced by people living in its community and in other parts of the world.

An integrated approach: a sustainable school takes an integrated approach to its improvement. It explores sustainable development through its teaching provision and learning (curriculum); in its values and ways of working (campus); and in its engagement of local people and partners (community).

A selection of 'doorways' or sustainability themes: the 'doorways' are entry points, or places where schools can establish or develop their sustainability practices. Each of the 'doorways' draws its inspiration from a range of national priorities around sustainable development. (Department for Education and Skills 2009).

The concept of measuring a range of indicators can be based around the three areas for an integrated approach: that of the curriculum, campus, and community, as described in the Sustainable Schools National Framework (Department for Children Schools and Families 2010). The information for these three areas is described further below in Table 2-2.

Table 2-2 *Curriculum, Campus, Community*

(Goodfellow and Andrew-Power 2008)

Integrated areas	Characteristics
Curriculum	Schools can use the curriculum to cultivate the knowledge, values and skills needed to address energy and water stewardship – both at a local and a global level.(e.g. learning about key issues like climate change)

Integrated areas	Characteristics
Campus	Schools can review their use of energy and water and establish policies for monitoring and reducing their use through good management and the deployment of appropriate technologies.(e.g. reducing the energy and water usage of the school)
Community	Schools can use their communications, services, contracts and partnerships to promote awareness of sustainable energy and water use among their stakeholders. (e.g. working with the community to improve local well-being)

These three areas of integration in the education sector may be seen as productive for the creation of an appropriate range of indicators. These are assessed through the collection of a variety of data that is available through the schools, their agencies and media outlets.

An evaluation of the school material that is published and headed under these areas is useful as a basis to match the UK governments own strategy and see how this can be analysed under the framework described below.

2.3.3 Eight Doorways

The Department for Education (DfE) and the previous Department for Children, Schools and Families (DCSF) promotes the 'Sustainable Schools' strategy based on the eight 'doorways' for schools. This is to embed sustainability in the three areas of schools' endeavours: the curriculum; the campus; and the community

The eight 'doorways' framework is applied to schools and used as a driver for sustainability, and is explained as the themes for schools to develop their sustainability practices. Each of the 'doorways' is drawn from a range of government policies on sustainable development. There are recommendations given to schools for each 'doorway, (Department for Children Schools and Families 2008).

The schematic diagram in Figure 2-3 shows the eight 'doorways' framework, and indicates how they can be seen to interact with each other and provide a framework for sustainability in schools. These themes are used as a basis for the keyword analysis of the school websites. A full explanation of these 'doorways' is given in Appendix D.

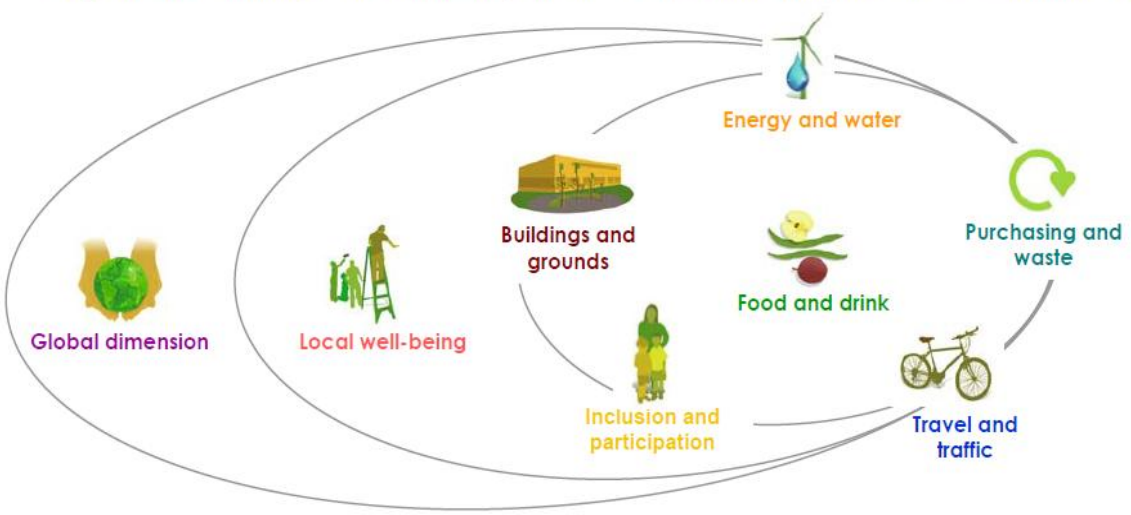

Figure 2-3 *Sustainability themes for the Sustainable Schools Framework*

(Sustainable Development Commission 2008, p.8)

The opportunities and recommendations for the implementation of the eight 'doorways' are noted in more detail below and they are also presented in a list in Table 2-3. These are a component for the selection of keywords and are compared with other measures in the section on content analysis in Chapter 5.

Table 2-3 *Eight doorways*

(Department for Children Schools and Families 2008)

Doorways	
Food and drink	Energy and water
Travel and traffic	Purchasing and waste
Buildings and grounds	Inclusion and participation
Local well-being	Global dimension

The use of a range of measures is important to analyse the extent that sustainability issues are incorporated into school activities; whether they are science based via the curriculum or occurring in the other subject areas, or through campus or community initiatives.

2.3.4 Nine key areas

In contrast to the eight 'doorways' sustainability framework, there are other strategies initiated by the DCSF, where each affects the areas of curriculum, campus, and the community (Department for Children Schools and Families 2008). Ofsted has mentioned nine key areas in influencing the school approach to sustainability issues (Ofsted 2003). There are nine topics as key areas, which are mentioned in the report by Ofsted (2003) as noted in Table 2-4 which were utilised in sustainability reporting by Ofsted when they reviewed schools.

Table 2-4 *Nine Topics for sustainability*

(Ofsted 2003)

Sustainability Topics	
Learning	Management
Teaching	Decision-making
Curriculum	Purchasing
Grounds and learning	Specific projects
General environmental indicators	

The QCA provides a framework of sustainability terms which have been derived from work on the measures for schools (Qualifications and Curriculum Authority 2002).

2.3.5 The Four Capitals and Five Capitals

There is also a range of other ways to construct a strategy for looking at sustainability issues and that is through a framework termed the 'Four Capitals' (Ekins 1992).

The 'Four Capitals' covers the area of ecological economics where human input is characterised as a resource as are the other inputs of materials and resources into the functioning of human lifestyles and industrial production as noted in Table 2-5 below (there is an extended version in Appendix B).

Table 2-5 *Four capitals for sustainability*

(Ekins 1992)

Capitals	Attributes
Human capital	The knowledge, skills, health and fitness of people are important they need to be showing a relevance to achieving a sustainable world where resources are scarcer while human population is increasing.
Natural capital	The resources of the planet are consumed; from air, water, food, fuels (fossil and renewable), and minerals, to the discharge of pollutants into the air, waters and land. These are also known as the natural services that our planet provides.
Physical capital	The product of the transformation of the natural resources using the human resources. It is the buildings, the roads, appliances, clothes etc that we use more and more of each year. The type of physical capital that is created will be important if it is to be relevant in a sustainable society.
Social capital	Looking at the extent that people are members of a family, the links to neighbours and the community – these can be based on the distance that families live from the school they attend, the involvement of the school with the parents and the wider community.

This concept can be applied to the context of educational institutions, with some amendments. The physical capital would be applied to the school campus where the buildings and ICT, grounds and transport, purchasing and waste, are taken into account.

The natural capital covers the use of foodstuffs, energy and water and the release of emissions in the form of aerosols, wastewater and other discharges into the natural environment. These are assimilated as part of the natural ecosystem services provided by the planet.

The social dimension is seen as affecting the community, where there is interaction with the society of the school and the wider community with families, organisations and industry. There is also the connection and interdependence with a wider outlook toward global challenges and contact with pupils in other countries and the wider international community on a global dimension.

The human capital is what schools are ultimately about, where pupils are able to gain knowledge, values and skills to debate and make decisions that are part of the taught curriculum and the imbedded ethos that guides a responsibility for a sustainable future.

A further refinement to the capitals is the use of the five capitals which has been developed, where the physical capital is subdivided into the manufactured and the financial capitals, as shown below in Figure 2-4. Further details of the five capitals concept are given in Appendix E.

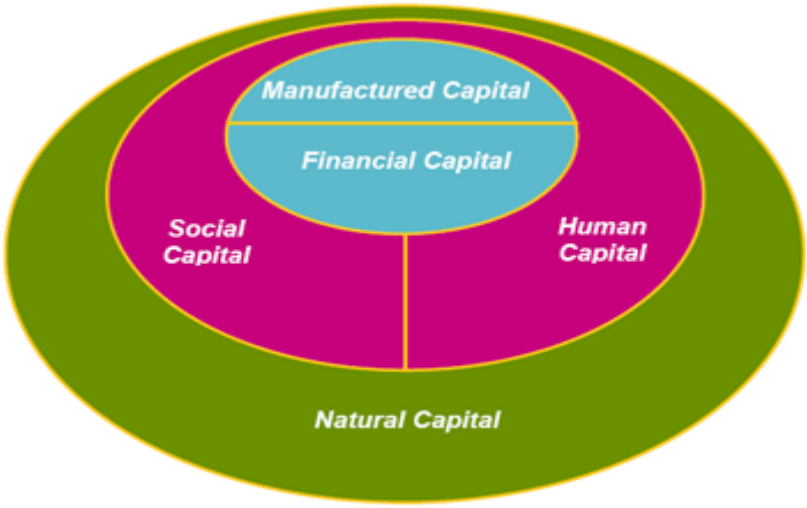

Figure 2-4 *The Five Capitals*

(Forum for the Future 2011)

The five capitals are used as part of a business approach where the importance of manufactured products and financial services are intrinsic to the functioning of any process as a system, which needs to be working towards sustainable goals.

2.3.6 Eco-Schools Framework

Eco-Schools is one of five environmental education programmes run internationally by the Foundation for Environmental Education (FEE) (Foundation for Environmental Education 2012). It is part of an international awarding programme that provides a framework for schools to address their sustainability issues and gain recognition of their achievements.

The Eco-Schools Programme (ESP) is an international programme that has been operating in schools around the world and has around 70% of schools in England registered, with the primary schools the largest in number (Eco-Schools 2012).

The ESP is seen as one of the largest sustainable schools programmes in over forty countries around the world. In England the environmental charity, Keep Britain Tidy, is the organisation that administers the Eco-Schools, with about 17,000 schools in England registered for the programme: " the Eco-Schools programme is completely free and is designed to be flexible to make tackling sustainable issues manageable and easy for any school." (Eco-Schools 2012, para.9).

Once registered, schools follow a seven-step process which helps them to address a variety of environmental themes. These range from litter and waste, to healthy living and biodiversity, where the pupils are seen as the most important resource for action as noted below:

> One of the key aims of Eco-Schools is to see the whole school participate in environmental activity. Whilst the Eco-Committee will take the lead on planning and developing the Action Plan, it is very important that as many pupils, teachers and staff participate in the projects as possible. For pupils to really engage with Eco-Schools and feel proud of their achievements, the Eco-Committee needs to ensure the whole school is involved. (Eco-Schools 2012, para.1).

It is also noted that there is a graduated programme of awards which are based on their initial self-assessment. At the higher award levels an external assessment is undertaken by volunteers who are trained to provide an Eco-School audit:

> Schools work towards gaining one of three awards – Bronze, Silver and the prestigious Green Flag award, which symbolises excellence in the field of environmental activity. Bronze and Silver are both self-accredited through this website and Green Flag is externally assessed by Keep Britain Tidy (Eco-Schools 2012, para.6).

Schools that incorporate Eco-Schools into their curriculum are increasingly being commended by Ofsted for their pupil engagement and citizenship (Ofsted 2009). Similarly there is anecdotal evidence from the ESP (Tibke 2012) that schools are showing a real benefit from the award scheme and that there is, " a growing body of

evidence that Eco-Schools are much more likely than non-Eco-Schools to implement good practice measures which help reduce carbon, waste and water use and promote healthier living and greater community cohesion." (Eco-Schools 2012, para.1).

While these are all seen as worthy aspirations and there are templates for the development of these initiatives, there is also a strong desire to get publicity for schools

> When you achieve Bronze and Silver awards, you receive a certificate that proves your commitment and a logo you can use. ... Green Flag award winners are advised to write to their local MP and the Director of Education in their local education authority. This can result in a congratulatory letter for the school or even a visit which could be used as a good media opportunity to promote your school. (Eco-Schools 2012, para.4)

It is also noted that the schools are likely to benefit from the recognition and publicity opportunities that awards provide that "can raise the profile of your school locally, regionally, nationally and even internationally." (Eco-Schools 2012).

It can be noted that the ESP aims to: " provide schools with all the evidence they need to really shout about their environmental success." (Eco-Schools 2012). It is noted that all topics do not need to be addressed together, as working on one " you may find you make improvements in other areas, as they are designed to interlink" (Eco-Schools, 2012).

There is a further suggestion that through implementing the Eco-Schools Programme, the schools will improve their practices., a summary of the process is to Register for Eco-Schools; Form an Eco Committee; Conduct an Environmental and Develop an Action Plan (Eco-Schools 2012). More details on the steps to becoming an Eco-School are in Appendix G.

From the descriptions given above on the ESP it would appear that the implementation of the scheme would ensure marked improvement and visibility of the changes to be evident for the schools. There is an emphasis on the school gaining publicity for its activities and trying to involve more of the local community.

On the ESP website there are case studies given, although the details of how the evidence has been developed and the conclusions arrived at, is not readily evident from

the information available. The opportunities to promote the school will be looked at again in the analysis of the collected data from the school websites, newsletters and reports.

The ESP wants to make sustainability an integral part of the school, using a simple framework. This is based on nine environmental topics focused around implementing: biodiversity, energy, global perspectives, healthy living, litter, school grounds, transport, waste, water (Eco-Schools 2012). Similar to the 'Sustainable Schools' strategy which highlights eight 'doorways' or areas where schools can become more sustainable, there is an aspiration statement or recommendation that schools on the ESP can work towards, based around nine topics (Eco-Schools 2012). The nine topics for the ESP framework are explained more fully in Appendix G.

Once the 'Action Plan' (as noted above) is organised, it is suggested to involve the whole community. The involvement of the community is also encouraged as part of the 'links to the community' where activities are designed to raise awareness of and involvement in local decision-making, and improve the community spirit (Eco-Schools 2012).

Further to the ESP encouraging schools to develop community links, there is a programme for greater reach to the wider population in which the school operates. The Eco-Schools concept has adopted a programme towards Eco-Communities nationally, such that:

> We believe that Eco-Schools can play a huge role in inspiring sustainable living – in their school and in their wider community.
>
> An Eco-Communities approach involves schools enhancing project work on themes like Energy and Waste reduction, by developing stronger links to:
>
> • School curriculum
>
> • Pupils' families – for example, through Eco-Homes projects and events
>
> • Community partners – other schools, Eco-Centres, community groups
>
> We found that an Eco-Communities approach can providing meaningful and enjoyable experiences for pupils, with the added benefit of engaging local communities in becoming more sustainable. (Eco-Schools 2012, para.1)

As can be noted from this extract, there are high expectations on the level of connection, interaction and achievement by implementing the ESP scheme. In addition to this, the

exemplar ‘Green Flag Ambassador’ schools can be combined with the sustainability and community experts, including the ‘Waste Watch’, ‘Climate Change Schools Project’, and ‘Eco-Communities’ (Eco-Schools 2011).

Another initiative from the Eco-Schools programme, under the auspices of KeepBritainTidy, has been to involve all LA schools as part of an energy reduction and Carbon Reduction Commitment (CRC). This initiative has been in operation since April 2010, as the UK's first mandatory carbon trading scheme. It covers both public and private sectors of the economy, and aims to help sectors cut Greenhouse Gas (GHG) emissions by 80% relative to their 1990 level by 2050 (Department of Energy and Climate Change 2011).

The first CRC performance league table was published by the Environment Agency in November 2011. However the evaluation, uptake and effect of the implementation of these combined initiatives is still to be realised. The table ranks the early action of organisations to manage their energy, and is based on reports submitted by scheme members (Department of Energy and Climate Change 2011).

Future league tables will be based on participant’s efforts to improve their energy efficiency. Their early action will have a diminished weighting each year, with metrics based on company growth and absolute emissions changes taking more prevalence. It is noted that organisations may improve on their performance in this area as energy efficiency becomes a ‘reputational issue’ by making the information available and open to the public (Department of Energy and Climate Change 2011).

As was noted on the original TeacherNet website, in the early years of implementing some of the programmes for incorporating the ‘Sustainable Schools’ strategy:

> Evidence of the impact of sustainable schools is supported by growing research, policy, and practitioner literature, in the main from the UK but also internationally. Multiple sources of evidence now show that being a sustainable school raises standards and enhances well-being. This is because sustainable schools engage young people in their learning therefore improving motivation and behaviour; they also promote healthy school environments and lifestyles. (Department for Children Schools and Families 2008, p.2)

However, with the recent changes in the 2010 government spending review which included changes to the education budgets, there is more pressure to meet current school expenditure with constrained budgets (Department for Education 2010).

2.3.7 EMAS and Schools

In 2005 a voluntary European Union (EU) initiative designed to improve an organisation's environmental performance, was undertaken by Environ (now Groundwork Leicester and Leicestershire) and implemented in a range of primary and secondary schools in Leicester City (Groundwork East Midlands 2011, European Commission 2012).

The Eco-Management and Audit Scheme (EMAS) was seen as a new approach in the evolving evaluation of schools, the uptake of EMAS in schools was a first in terms of implementing a structured programme and assessing the level of sustainability and how it would be measured and recognised (Groundwork 2009, Groundwork East Midlands 2011).

EMAS is designed to acknowledge organisations showing continued improvement in their environmental performance. Its aim was to recognise and reward those organisations that 'go beyond minimum legal compliance and continuously improve their environmental performance'.

EMAS has the distinctive key elements of: performance, credibility and transparency. In order to gain the recognition there are a series of processes to complete, from the initial registration of an organisation, through to the assessment for compliance and the annual reporting and approval (European Commission 2012).

In summary, to receive an award under EMAS an organisation must comply with the following steps as shown in Table 2-6. There are further details made available on the EMAS system in Appendix H.

Table 2-6 *EMAS process*

(European Commission 2012, para.3)

Stages	Actions
Conduct an environmental review of an organisation's activities, products and services	Adopt an environmental policy
From the results of the review, establish an effective environmental management system (EMS)	Develop an environmental programme
Provide an environmental statement with objectives of its environmental performance	Carry out an environmental audit

Note. The environmental review, EMS, audit procedure and the environmental statement must be approved by an accredited environmental verifier

The requirements listed here are generally transferable to a range of institutions and other organisations and include a framework for improving environmental management. The benefits commonly identified with the EMAS system are increased efficiency savings; reduced incidents for health and safety; and improved stakeholder relationships (European Commission 2012).

Additionally it has been noted that implementing an environmental management system has a range of benefits for schools. The Groundwork project in Leicester (initiated through Environ) included a range of features including: financial savings; curriculum enrichment activities; encourages the sharing of ideas and knowledge between schools (Groundwork East Midlands 2011). EMAS also promotes links and helps support other government agendas such as 'Healthy Schools', the 'Learning Outside of the Classroom Manifesto' and the 'Sustainable Schools Agenda' (Groundwork East Midlands 2011).

The use of these schemes is increasingly important in business situations and as noted, they can also be applied to educational institutions, with the example from Leicester City and the Groundwork Trust, as noted above (Groundwork East Midlands 2011).

2.4 Schools and Sustainability

National initiatives and worldwide programmes reflect a range of innovative approaches to sustainability education and awareness. However, it was mentioned in a report on the status of sustainable school programmes from an international perspective by Henderson and Tilbury (2004) that there is a lack of evaluation and research findings to address questions regarding implementation and effectiveness conclusively.

Educating for sustainability is increasingly seen as important to ensure sustainability for future generations. As has been noted in section 2.3, the issue of sustainability has been increasing in intensity with more requirements for products and services to reach standards, and this has filtered through to education in schools as a starting point for the education of the future generations (Eames 2009, Department for Environment Food and Rural Affairs 2012). As part of this input into the education system there has also been a need to take a measure on what has been achieved at an educational institution level.

The issue is the approach and pedagogy utilised to motivate and encourage students (and indeed anyone) to see the meaning and desire for this approach. One example of an educational movement developing in the UK, is the concept of co-operative schooling which has values to help transform and regenerate areas. It has been noted by Rosselson (2012, para.10) that giving people skills to contribute to their community in a sustainable way: “Co-operative schools offer a set of values for a secular world, and for a world concerned about sustainability, fairness and justice.” As mentioned by the Department for Children Schools and Families (2010), schools strive to enable learners to become successful, confident individuals, and responsible, caring citizens.

In North America, there are a range of different school systems measuring the sustainability credentials, one of these is the ‘STARS’ (Sustainability Tracking, Assessment and Rating System) framework for colleges and universities to self-report their sustainability performance. Introduced in 2010, from research and development by the higher education and sustainability communities in Canada and the USA and provided by Association for the Advancement of Sustainability in Higher Education (AASHE) (Association for the Advancement of Sustainability in Higher Education 2012). It has also been noted that there is increasing interest from educational institutions worldwide and AASHE wishes to extend this to include international educational

institution participation (Association for the Advancement of Sustainability in Higher Education 2012).

Also, through a collaboration with the Sierra Club, and by utilising a 'Campus Sustainability Data Collector', this provides the data to produce a ranking index of 'Cool Schools', comparing the information collected from participating schools about important aspects of their campus sustainability (Sierra Club 2011).

An overview of the UK education for sustainable development (ESD) presence was undertaken in 2010. There was an assessment of the progress on ESD and the Decade of Education for Sustainable Development (DESD). The review considered key themes that were important for monitoring ESD and the range of changes that had occurred over the previous years, with changes in legislation and government departments. The effect that climate change discourse in schools, had as a driver of ESD, was noted (UK National Commission for UNESCO 2010).

There is increasing discussion and research on the issues of resource use and sustainable practice in society in general and in education in particular (DCSF 2009). The UK government, like many others around the world has made efforts to address the issue of educating for sustainability (Solent Industry and Environment Association Southampton Environment Centre 2001, Henderson and Tilbury 2004, Department for Children Schools and Families 2008, Ofsted 2008, Department for Children Schools and Families 2009).

2.4.1 UK Sustainable Schools

In the UK a sustainable school is described as guided by a commitment to care for people and the environment. What goes on in a school is important, as well as educating, schools have a duty of care as noted in the Sustainable Schools strategy that: "a sustainable school is one that is guided by the principle of care for oneself, each other (across cultures, distances and time), and the environment (both far and near)." (Goodfellow and Andrew-Power 2008, p.11).

Schools are centres of learning, and also seen to be a special place, part of the social ethos, which is an important component of the community. When pupils are placed in the care of professionals in a school, the onus of the school is to act in 'loco parentis' in lieu of the parents. There are two statutory provisions that relate to the role of teachers

acting in loco parentis: first, the Children Act 1989 provides that teachers have a duty of care towards the children under their supervision (UK Government 2012). The school assumes some of the rights and responsibilities of the role of the parents, and needs to act with the same care. The duty of care is that of a 'reasonable parent'.

The second piece of legislation is the Health and Safety at Work, etc. Act 1974 (Health and Safety Executive 2006), is one of the most important areas of legislation for educational institutions requiring a safe place to work for all people. This places an onus on the school to provide a caring, protective and secure environment; while supporting the growth and development of the emotional, physical and mental wellbeing of their charges.

Schools, thus have a great duty of care and, in an increasingly complex and sophisticated world, need to be aware of operating health and safety in all aspects of the institution from the provision of healthy food and drink, supervision for safe sport and play, to safety in science lessons (Health and Safety Executive 2006). There are also greater demands on the administration to provide the support to meet national and local authority requirements, support teachers, assist parents and the children (Department for Education and Skills 2006).

The 'Sustainable Schools' programme began in 2003 as a UK government initiative, in collaboration with the Sustainable Development Commission (SDC) as part of the outcome of the inaugural Education for Sustainable Development Action Plan (Sustainability and Environmental Education 2010).

The 'Sustainable Schools' strategy outlines how schools can start their journey towards becoming sustainable, encouraging them to take on board the principles of sustainable development across all aspects of school life. As has been noted by Scott (2008), this means that; pupils should learn about sustainability in their lessons, as part of the curriculum; the school campus should be managed in a sustainable way and the school should act as a catalyst for sustainability within the local community.

Young people can be acutely aware of the conflicting signals that may arise when what they learn differs from what they experience. They may unknowingly learn from the action of adults and the environment they are exposed to as noted by the (Qualifications and Curriculum Authority 2002) report that the pupils are acutely aware of the values stated and values practised within the school.

The concept of sustainable schools is seen as an aspiration in the UK and especially for England, through policy documents from the education department of the governments at various times (Scott 2008, Department for Children Schools and Families 2009). The changes in policy and support from the educational departments has influenced the level of support and inclusion of sustainability in schools although more NGOs are now involved in this area (Department for Children Schools and Families 2010, Eco-Schools 2012).

Ofsted recommended that the Government should give higher priority to sustainability in schools, by supporting this through funding, and ensure that the curriculum reflected the importance of the subject (Ofsted 2008).

An Ofsted review of education for sustainable development, notes that it is making a difference. In the Ofsted survey, a group of schools were followed over a three-year period, to ascertain the effect that a focus on sustainable development is having on the actions of pupils and their families. It showed that schools gained in many ways. The benefit of improvements were in cost savings, better pupil behaviour and wider community relationships (Ofsted 2009).

Ofsted conducted a survey in England in 2003 on education for sustainable development in schools, which investigated the extent schools were addressing Government expectations for sustainable schools, as set out in the 'National Framework', and to identify possible barriers to progress. This started a debate on ESD in schools in England (Ofsted 2003). Following on from this work a further survey was conducted which was based on another series of inspections where sustainability for schools had a lower level of support: "Sustainability was not seen to be a high priority and schools were unaware that Ofsted was interested in assessing how schools were promoting and encouraging pupils to lead sustainable lifestyles." (Ofsted 2008, p.27).

The reports on sustainable schools show that there is not the ongoing support to drive the action and activities that are anticipated to bring about the transformation required to the curriculum, campus and community (Scott 2010). It has also been noted by Scott (2011), when discussing the work for the World-Wide Fund for Nature (WWF) by Gayford, that their project on education for sustainable development found that where an institution is seen by students to care enough to focus on sustainability issues, this can be a key motivator (Scott 2011).

Further to this, in the Ofsted report (Ofsted 2008) it was also noted that the majority of schools were not well versed in initiatives for sustainability, with limited knowledge in this area, and:

> Work on sustainability tended to be piecemeal and uncoordinated, often confined to extra-curricular activities and special events rather than being an integral part of the curriculum. Therefore, its impact tended to be short-lived and limited to small groups of pupils (Ofsted 2008, p.4).

However it has been noted by NCSL (2011) that there is a disconnect between what the school is doing and what they state are their values or the importance of sustainability. There are also issues with being able to record the effects of the school activities:

> While there is growing evidence of the impact of sustainability in schools, it is often difficult to collate, especially when we look to measures of success that are over long timescales and are impacting on the quality of life of the wider community (National College for School Leadership 2011, p.24).

The evidence presented by the NCSL (National College for School Leadership 2011) report showed that the importance placed on disclosing the measures towards sustainability of a school was of a low priority. It is apparent that improvements can be made in presenting information that provides transparency and accountability of the schools activities in sustainability.

More educational institutions appear to be aware and knowledgeable on issues of the environment and sustainability, with many schools participating in award schemes, undergoing audits, external validation and in-house projects which explore and embrace sustainability themes (Groundwork East Midlands 2011, Eco-Schools 2012, Ofsted 2012).

2.4.1.1 Specialist Schools and Sustainability

Sustainable development is linked formally to four statutory subjects in the National Curriculum for England. These are citizenship, design and technology, geography and science, which are all areas of specialism for schools to focus on (Department for Education 2012).

The issue of disclosure of the operation of the school becomes important when seen from the viewpoint that the educational institutions are part of the community and need to be accountable to this local stakeholder.

An interactive tool which enables schools to record evidence and report improvements and benefits to the school through the areas of curriculum, campus and community, is available. The ‘s3’ self-evaluation form is based round the eight sustainable development ‘doorways’ of the national framework for sustainable schools (Department for Education and Skills 2009). This tool has been amended and upgraded since its first inception and is still available for schools to use through the education department and affiliated websites (Department for Education and Skills 2009, Sustainability and Environmental Education 2009).

The Specialist Schools Programme (SSP), in partnership with the private sector and sponsors, is supported by Government funding that is additional to the school budget, allocated by the LAs. It aims to recognise outstanding characteristics in secondary school through specialisms and with targets that improve those standards.

The promotion of specialist schools aims to develop centres of curriculum excellence which helps to improve whole schools by encouraging changes in the way educational provision is addressed and by raising standards for all students.

The specialist schools are state secondary schools that aim to be local centres of excellence in their chosen specialism, and which benefit from the SSP public funding and from private sector sponsorship (Politics 2010).

There are six objectives given for the Specialist Schools Programme as:

- To extend the range of opportunities available to pupils which best meet their needs and interests
- To raise standards of teaching and learning in the specialist subjects
- To raise standards of achievement for all their pupils of all abilities
- To develop within the schools characteristics which signal their changed identity and which reflect the school's aims
- To benefit other schools and the wider community in the area ("extended provision")
- To strengthen the links between schools and private and charitable sponsors

(Politics 2010, para.3)

In 1994, the SSP was opened up to all secondary schools and the new specialisms of language, arts and sports colleges, announced in 1996. Over several years there have been developments for the SSP. The School Standards and Framework Act 1998, represents a commitment to Specialist Schools, and introduced the power to select pupils on the basis of aptitude. In 2001, the proposal from "Schools: Building on Success" Green Paper, added four new specialisms, which included the subject of Science (Politics 2010).

2.5 Schools in the UK

The Labour Government in 2006 wanted all schools to become sustainable by 2020, as part of its ambitious £45 billion, BSF programme, to rebuild or refurbish all secondary schools in the country (Department for Education 2010). This government believed that schools play a vital part in developing the skills children need to lead sustainable lives.

In the UK the education system for compulsory age pupils is made up of state and private schools, with a range of categories having different funding arrangements, levels of autonomy, and management implementation. A summary of these arrangements is shown in Table 2-7.

Table 2-7 *Types of schools and funding, autonomy in the UK*

(Compiled from data at the Department for Education 2011)

School category	Type of funding	Level of autonomy
Academies	Private and State maintained	High
Community funded	State maintained	Medium
Faith-based	State maintained	Medium
Foundation	Private and State maintained	High
Free schools	Private and State maintained	High
Independent	Private	High
Special schools	State maintained	Medium
Voluntary Aided	Religious group and State	Medium

2.5.1 Science Education in Schools

Science education has much to offer in pedagogy with many of the observable environmental measures installed in some schools. These range from rainwater systems, to energy use and renewable technology. In many cases these are linked to studies in the science curriculum (1010global 2010).

The use of science education is seen as an important part of the curriculum especially for the area of sustainability (Tytler and Symington 2006, Murcia 2009). Science education has a long history associated with an enquiring approach to the world based on a strong scientific basis and a conceptual change which does not generate dissatisfaction.

There is also the need to be able to identify conceptual change processes for instructional learning, based on believable, plausible, and non-contradictory conceptions where the meaning is understood by the student and may be assimilated and replace prior conceptions. This would be an area of interest to ascertain to what extent this would have implications for how sustainability concepts are assimilated within science education.(Treagust and Duit 2009). Additionally, there is also a legacy of pedagogy developed through the movements of the ecological and green philosophies (Derrick 1972, Schumacher 1973).

2.5.1.1 Science Status Schools

In 2001 the specialism for science was introduced to the school system as part of a drive to improve standards in the schools. Schools were required to gain sponsorship in the specialism with funding also from the government in the form of a capital grant and ongoing funds (Department for Education and Skills 2001). Changes in government and the funding of schools has seen the specialism funding now become part of the general school budget, and no specific requirements for the specialism (Department for Education 2011). The science curriculum should cover important issues relating to sustainability, such as renewable energy, the science of global warming and biodiversity. (Ofsted 2008)

More recently the DfE has decided to change the funding arrangements for the specialist science schools and there is no longer any requirement for these schools to seek re-designation (Department for Education 2011).

2.5.2 Academies

Academy schools are an initiative brought in by the previous Labour government, initially to improve the performance of failing schools especially in the inner city areas of the main cities. The 'City Academies'[6] were sponsored by benefactors of a commercial or philanthropic nature and sought to provide new schools with new buildings, ethos and structure.

The funding, usually provided through the local authority for schools, came directly from government for the new city academies. Since that time the concept has spread to rural, specialist and now all schools can opt out of local authority control, gain a commercial benefactor and have government funding which is directed through an intermediary body (Department for Education 2012).

More schools in England are encouraged to convert to become academies, with currently over 50% of secondary schools in England (of about 3,300) converted or are going through the application process (Department for Education 2012). It can be noted that academies are no longer accountable to LAs and have the capacity to implement their own structures for operating and management (Department for Education 2012).

Academy schools were established over a decade ago to improve standards of failing schools in city areas of local authorities and later expanded to include rural schools too (Department for Education 2012). Schools in England are encouraged to become academies to form collaborative partnerships with high achieving schools, colleges, universities and businesses (Department for Education, 2012).

The government has "no ideological objection" to businesses seeking profits from the new generation of academy schools and Free Schools (Gove 2012). At present, academy schools are run independently but are still classed as public sector bodies, as the surpluses cannot go to shareholders. Some schools have already obtained approval to have management run by a commercial company.

It is expected that the government will remove barriers to profit-making in the future to allow shareholders to own the school business – the significance of this would that

[6] City Academies were to improve the performance of schools in England's inner cities

schools need to be disclosing all their activities (due to their public funding) and would need to be accountable and transparent in their operations and achievements.
There is a need to ensure schools are operating to maximise the financial return and efficiently as the public funds should be contributing to sustainable actions and not at odds with the sustainability agenda of the “greenest government ever” (The Conservative Party 2010).

The Policy Exchange, a Conservative thinktank, recently noted that private companies could give employees a share of ownership and re-invest some profit back into the school under a social enterprise model (Gove 2012).

2.5.3 Free Schools

There are also options for schools now to be set up as Free Schools where a management company organises the administrative and teaching arrangements and a building may be leased or built to house the new school. The Free Schools have greater flexibility and freedom in how and what they teach in their ethos and operation similarly to private schools, although public funding is applied to account for the numbers of pupils that are educated at these schools (Department for Education 2012).

2.5.4 Buildings

All buildings have an effect on the environment, whether it is the resources procured for construction, the energy expended on the materials, during the building process or over the operational lifetime. As noted by Ecoliteracy (2012) the school buildings as well as areas of the school grounds can be transformed into educational resources. They can become part of the curriculum and part of the community. This reflects the ethos of the curriculum, campus and community framework used for sustainable education initiatives around the UK (Department for Children Schools and Families 2009)

As buildings are expected to last a long time (90% of the UK building stock will be around in 2050) it is important they are of a sustainable design, therefore when any new building is constructed or any upgrade, refurbishment or fit-out needs to be completed this needs to be made as energy efficient as practicable. The energy use over a buildings lifetime can be substantial compared to the energy for its construction (Department for Children Schools and Families 2009).

It is also noted that some of the new school buildings have been recognised for their sustainability achievements and some retrofit options have included energy efficiency and on-site energy production with display panels to inform the school and the public of their operation (Department for Children Schools and Families 2009). An example of one type of display panel provided in a school is shown in Figure 2-5 below.

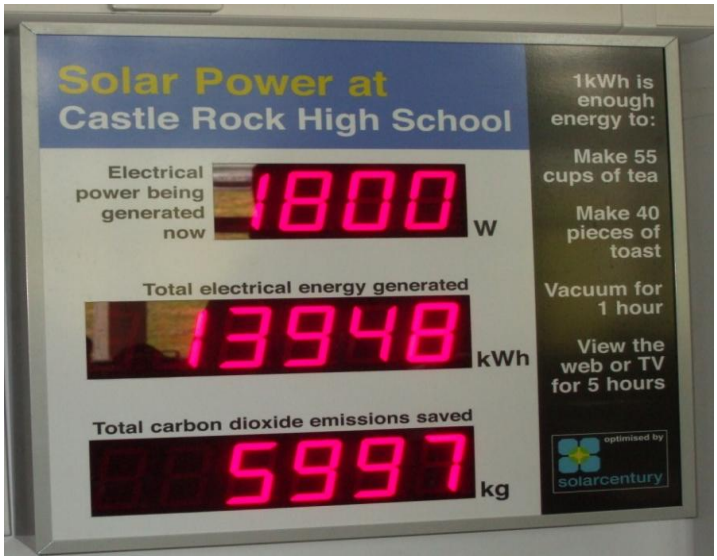

Figure 2-5 *Solar electric display panel*

(Author)

Sustainability should be considered throughout the building process, as both an environmental and social aim to conserve resources and use materials efficaciously, and allow for future generations. Starting with the design concept, site analysis and location, the detailed design and specification of the building should ensure that both short and long-term environmental impacts are kept to a minimum.

As noted below, the complete construction of a building and the finished building itself can be a lesson in sustainability for the school users, with education for sustainable development as part of the 'National Curriculum' (Department for Education 2012). For a building development, there are several key issues to consider, as noted by the DCSF table of characteristics below (Table 2-8).

Table 2-8 *Characteristics of a Zero Carbon School Building*

(Department for Children Schools and Families 2008)

Design characteristics	
Selection of site to minimise transport use	Use of timber from sustainable sources
Design for low maintenance	Use of local and recycled materials
Orientation of the building to maximise daylight, reduce noise, disturbance, etc.	Minimisation of construction waste

There is also the need for a long-term view when considering sustainable design solutions, especially for an educational building that is expected to last for twenty-five to fifty years. The initial capital cost needs to be balanced against a lifecycle cost analysis. Using such analysis techniques for allocating finances might allow for greater use of sustainable materials and construction techniques that might have initially been disregarded due to availability or cost (Department for Children Schools and Families 2008).

In recent years there has been a change in how much funding local education authorities receive per year from central government, and how that money is used (Department for Education 2010). Building Schools for the Future funding has been reduced as new academy status schools are increasing in numbers (Department for Education 2010, Gove 2012).

There is a need to relate the buildings to the curriculum as is noted in a briefing by Ofsted (2008) that the DCFS should be concerned with the effect of buildings in schools and thus there is a need to " link learning about sustainable development more closely to 'Building Schools for the Future' and other capital investment, refurbishment and maintenance programmes" (Ofsted 2008, p.6).

The Schools Environment Assessment Method (SEAM) provided a framework for designing a sustainable school. In order to find out how environmentally-friendly their school, or school design is, schools were able to carry out a self-assessment survey. A Research Council UK funded study undertaken with BSF schools at the early design stage, found that the involvement had an empowering effect for the staff and pupils and also helped the designers understand the needs of their clients in their educational environment (Charnley, Fleming et al. 2010).

The Schools Environmental Assessment Method (SEAM) was a government funded initiative published by the Department as a self-assessment tool in 1995 for a framework for designing a sustainable school, to allow schools to self-evaluate the extent of their school building or design. SEAM was, however superseded by the Framework for Sustainable Development in Schools (Department for Education and Skills 2004)

2.5.4.1 BREEAM

The use of a building assessment method developed for schools (SEAM), later allowed a more robust system to be incorporated for use in a certification scheme, against which the Department for Education and Skills set targets for new and refurbished school projects (Department for Education and Skills 2004).

The Building Research Establishment Energy Assessment Method (BREEAM) system is a building audit and assessment system used throughout the building and construction industries to identify a range of environmental efficiencies in a building through design, construction, operation and maintenance (Building Research Establishment Energy Assessment Method 2012).

There are a range of attainment levels within BREEAM and any project may aim to achieve an overall rating of good to excellent depending on the requirements for the client. Many educational facilities plan to achieve the standard of excellence for their new build under BSF, although cost constraints may deem a lower attainment level. There are a number of benchmarks that have to be achieved throughout the project and the progress is audited by BREEAM auditors and independent auditors on behalf of BRE (Building Research Establishment Energy Assessment Method 2012).

There is a great opportunity to address environmental effects through better management and improvement of the existing building stock. BREEAM In-Use, is a scheme to help building managers reduce the running costs and improve the environmental performance of existing buildings. It consists of a standard assessment methodology and an independent certification process that provides a systematic way to assessing and improving the level of sustainability reached through the use of a building.

It is noted that Parts 1 and 2 of the BREEAM In-Use Certification Scheme are relevant to all non-domestic: commercial, industrial, retail and institutional buildings. This

programme has been developed to recognise and encourage better building management and targeted investment in existing building stock (Building Research Establishment Energy Assessment Method 2012).

In England, BREEAM attainment is required for the procurement frameworks managed by Partnerships for Schools (an executive body responsible for delivering all schools capital investment programmes for the DfE). Secondary schools procured through the Building Schools for the Future capital programme were required to achieve a BREEAM (or equivalent) 'Very Good' rating (Building Research Establishment Energy Assessment Method 2012).

BREEAM for education, as a new or retrofit assessment method and certification scheme, is used at the design, construction, and refurbishment stage of a school building. It can be used to assess educational buildings such as secondary schools (Building Research Establishment Energy Assessment Method 2012).

2.5.5 Energy efficiency

Energy efficiency and conservation efforts can be effective, and easy options in the initial design of school buildings, especially as energy costs are increasing and likely to continue to do so in the future. The use of energy measures can be an easy way to audit the performance of a building or process.

Since April 2001, the Climate Change Levy (CCL) has been applied to energy use in schools, adding roughly 10 per cent to school fuel bills. It has been estimated that simple measures, involving occupant behaviour and changes to heating and lighting regimes can significantly reduce energy usage by as much as 20 per cent. This emphasises the importance that energy efficiency has in public buildings, especially schools, as exemplars for future generations (Department for Children Schools and Families 2009).

There is continuing work underway to benchmark the use of more resources in schools (Carbon Trust 2005). For example the use of water, electricity, gas and other main resources have been under greater scrutiny for some time (Stuart, Fleming et al. 2005). Also, the local authorities are under greater financial pressure to reduce costs, therefore energy and other resources are areas for action in the education sector (Department for Education 2012).

2.5.5.1 Displaying Energy Information

It is interesting to note that Department of Energy and Climate Change (DECC) and Department of Communities and Local Government (DCLG), as do many of the Whitehall departments, provide an online display that allows members of the public to view current energy use and review historical energy use of their different buildings and departments (Department of Energy and Climate Change 2012).

Many schools are also linked to metering which allows data to be collected on a half-hourly basis for electricity, water and gas. There are also increasing numbers of schools that are producing their own energy from the installation and operation of photovoltaic panel systems and many with display boards showing the use of rainwater systems (1010global 2010). An example of the type of display provided with this system is shown below in Figure 2-6, although this particular display was not functioning since its installation although set up in the science classroom for possible utilisation.

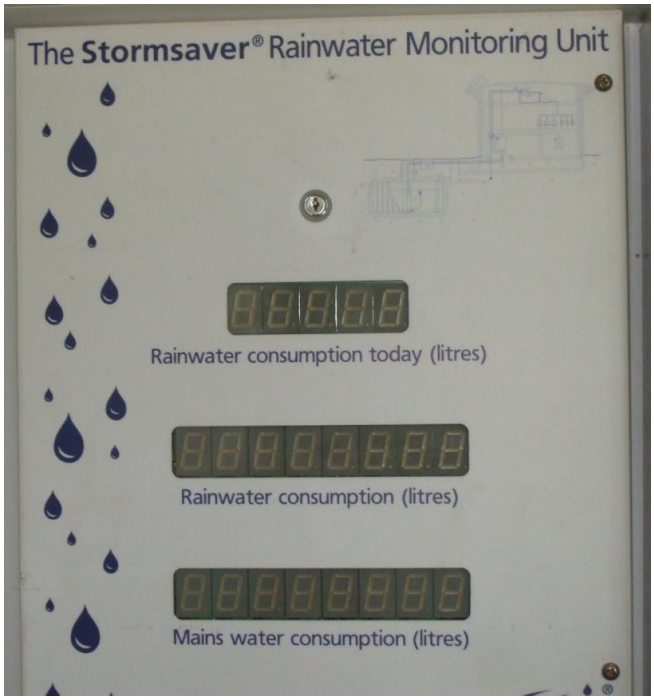

Figure 2-6 *Water usage display panel*

(Author)

2.5.5.2 Display Energy Certificates

As part of the European-wide initiatives on improving energy performance in buildings there is an EU Directive called the EPBD (Energy Performance Buildings Directive). The UK government implemented legislation to meet the EU EPBD, which has been

introduced to encourage good energy management of buildings. Simple monitoring of energy consumption in schools identifies where waste is occurring and allows savings to be made (Communities and Local Government 2008).

Public and commercial buildings over a certain size are required by legislation to have commissioned, provide and show a Display Energy performance Certificate (DEC). The certificate is designed to be similar in appearance to energy efficiency labels that are required for many new household white-goods in the EC countries (see the section on the energy data in Chapter 5). The format is based on the energy grading of appliances which has been used for several years throughout the EU.

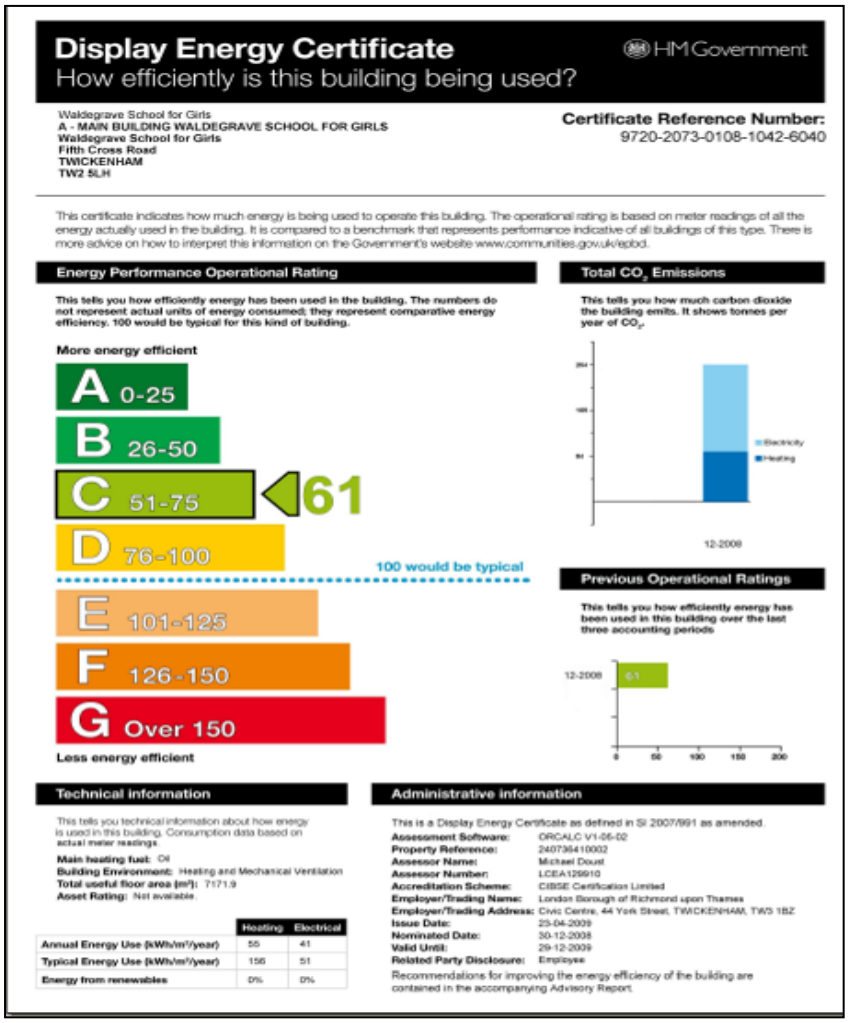

Figure 2-7 *Display Energy Certificate*

(Communities and Local Government 2008)

As shown in Figure 2-7, the DEC provides a comparative measure of the efficient use of energy in the different buildings in the schools. Data is also provided on the CO_2

emissions and water usage. It is important to establish the extent that new arrangements for schools necessitate or negate the need for DECs or sustainability reporting or are seen as a required part of the schools' responsibilities.

DECs were introduced to raise public awareness of energy use by displaying the actual energy use and energy efficiency of the buildings. The DEC provides information on the type of heating fuel (usually oil, gas or electricity), the amount of energy used per square metre of building (in kilowatt hours), for the heating and the electricity usage. This is based on records of gas, electricity and other meter readings or fuel delivery records in the case of oil or solid fuel. If there is any use of renewable energy to provide heat or electricity it is also noted on the display certificate. As shown in Figure 2-7 above, the DECs include an A-G energy rating for the building, where "A" has the lowest CO_2 (carbon dioxide) emissions (best) and G the highest CO_2 emissions (worst).

The rating, from A-G, is also shown as a number, where a typical building would have a comparative rating of 100 and a building with twice the typical CO_2 emissions would have a rating of 200 (or G). The DEC rating shows whether the occupier is using energy effectively or less so, with a trend also showing the consumption over the last three years.

The regulations require a certificate to be displayed in each individual qualifying building over 1000m^2 in floor area, although for smaller blocks and temporary classrooms, where they are each less than 1000m^2 (even if the total floor area of the school exceeds 1000m^2) a DEC is not required. The consumption is based on the electricity, gas and water meters, and can be apportioned based on floor area where there are not separate meters for individual qualifying buildings. School sites with several large buildings require more than one certificate for the whole site, with a certificate for each building that is over the threshold limits. In the study examples there are a range of schools that fit into both categories (Communities and Local Government 2008).

The requirements are that the DECs should be clearly displayed at all times in a prominent place in the school, clearly visible to the public. This is usually seen in the main public entrance for the school. As part of the legislation there is also an 'Advisory Report', which provides a list of effective measures to improve the energy rating of the building, although this does not need to be displayed. These 'Advisory Reports' and the DECs are required to be updated on an annual basis according to the DCLG (Communities and Local Government 2008). The availability of these reports on school

websites is a consideration as part of sustainability reporting for schools when improving their disclosure and accountability.

2.5.1 Research Questions from Literature Review One

In the literature noted in Chapter 2 there is a substantial amount of research conducted surrounding sustainability attributes, yet there is a significant gap within the context of disclosing systemic sustainability issues in education. This supports the need for the analysis and development of two of the main research questions.

Q1 How do science schools compare to other secondary schools in their attainment level?

The science schools are a subset of the secondary schools and have been chosen to elicit information to corroborate with the literature on the extent that the status for these schools will provide a better response to the reporting of sustainability.

Q2 To what extent do science schools compare to exemplars of sustainable schools in terms of the measures of sustainability?

Science schools are compared to some exemplar schools on sustainability levels, in order to gain some level of understanding on whether they are meeting best practise as shown by the exemplar schools.

2.6 Summary of Literature Review One

The literature review has recognised the lack of guidance or support for schools to adopt a whole systems approach on reporting their sustainability initiatives to a wider audience of stakeholders.

This study is designed to address the issues that have been presented on systems, sustainability and the extent that science education in schools affects sustainability outcomes. The culmination of reviewing the literature has identified gaps in current knowledge in the areas of a whole-school approach to reporting sustainability.

There is a requirement for robust measures of sustainability, to be based on systems thinking. From a review of the literature surrounding the concepts of systems, sustainability and the need for transparency and accountability; the gaps in current

knowledge have been identified. The research has promulgated a series of questions based on an overarching hypothesis which has been validated through the discussion.

The sustainability of schools and educating about sustainability are two quite different concepts. While there is effort in both areas there needs to be greater coordination and integration of these sustainability endeavours. The argument for the use of ‘doorways’, ‘capitals’ or other defining frameworks and key phrases is increased with the need to incorporate action and activities into the curriculum, campus, and community areas.

This thesis analyses the public information provided by the schools with special science status, based on the secondary schools in England. Additional information, as provided from the appropriate agencies, is also used to see to what extent the initiatives and aspirations for creating sustainable educational institutions are met, and the significance that science status may have on a school’s disclosure and reporting of their sustainability outcomes.

Examples of reporting initiatives using a variety of information have been shown to exist in publicly available databases which could be incorporated into school websites. There is an overview of the main theories for use in the study to analyse the use of information disclosure practice, and the use of websites and issues of reporting on sustainability are investigated further in the next chapter.

Chapter 3 Literature Review Two:
Theories for Reporting and Website Presence

3 Introduction

This chapter provides an overview of the theories in investigating disclosure of information and the need for Integrated Reporting in organisations, covering their operations and management of sustainability issues and its dissemination through websites.

It has been noted in a report that: " greater value will be gained once both sets of information [responsibility and financial] are treated as part of .... performance reporting, both to internal management and external stakeholders " (KPMG 2011, p.3).

3.1 Theoretical Considerations of Disclosure

There is a range of theories that can be applied to the area of reporting and disclosure of an organisation's operations (Jose and Lee 2007, International Exellence University School of Communication 2010, Cotter, Lokman et al. 2011). These theories are applied to many businesses and organisations, and can be applicable to educational institutions (Jetty and Beattie 2009; Jenkins 2010).

Cotter, Lokman et al (2011) note that this voluntary disclosure of information can be categorised into three areas of reporting: the strategic and forward looking, which relates to corporate strategy and general information; then there is financial information, which reviews costs and pricing; and then the non-financial information on governance, social responsibility and environmental reporting.

3.1.1 Three theories for disclosure

The use of a particular type of disclosure theory will depend on the specifics of the information to disclose and the context of the situation (Cotter, Lokman et al. 2011). It is the non-financial reporting of information which is of interest to this study, and as such there are three appropriate theories to consider.

Three theories for the disclosure of information are critically examined for their applicability to schools, based on the use of information and inclusion in reporting through websites. The theoretical framework that underpins this research is grounded in the area of stakeholder theory, as explained in the last of the three theories as discussed below.

3.1.1.1 Legitimacy Theory

This theory examines the concept of acceptable action in society, which is described as legitimacy. Legitimacy theory is based on the concept of a social contract between the organisation and society. The accepted norms and standards are demonstrated by the organisation, and they are adhered to through the communication of information (Cotter, Lokman et al. 2011).

It is noted that legitimacy theory is relatively undeveloped to show an organisations motivation for disclosure of its operations (Deegan 2002). It has also been noted that some prior research has been inconsistent in supporting legitimacy theory (Wilmshurst and Frost 2000). While Deegan (2007) notes that for reporting of sustainability information, the use of organisational theory is seen as a motive for change. However, the use of a theory, where the interaction which occurs is noted, and the concept of information which is transmitted to others is important, is discussed as part of signalling to the stakeholders of the operations of an organisation.

Similarly, the theory of legitimacy recognises the need to conform to social norms, although as the status of a school changes so it needs to change how it conforms to continue in a trust relationship with society (Freeman 1984, Weiss 1995). Deegan (2007) who writes that legitimacy theory is a positive theory and there exists many similarities between stakeholder theory and legitimacy theory.

3.1.1.2 Signalling Theory

Signalling theory, is a way of understanding the challenges that are apparent when there is information asymmetry, where one group has the information which can be signalled or communicated to others; it involves the reporting of information of value about the organisation through voluntary disclosure (Jose and Lee 2007).

Other views on the use of signalling theory have noted that if one party has information opportunities which are better than another then there is incomplete indication and communication of resources, which provides unfair advantage to one party.

3.1.1.3 Stakeholder Theory

The third theory considered is stakeholder theory, which takes the definition of a stakeholder as noted by Freeman "any group or individual who can affect or is affected by the achievement of the organization's objectives" (1984, p.46).

Stakeholder theory can also be seen as inclusive, where an organisation is part of a social system. This theory has an approach of emphasising organisational management which considers their stakeholders in the organisation, are included in the decision making process. It assumes that decisions cannot be made without the consideration of others' interests. Phillips, Freeman and Wicks (2003) note that stakeholder theory calls on organisations to give attention to those affected by their actions, which is a moral claim.

The theory incorporates the concept of the responsibility to achieve more than 'do good'. It is necessary to recognise that the daily operations affect stakeholders. Within those effects, there is responsibility, to be transparent and accountable to the wider community. Stakeholder theory may be an established framework to identify and examine the activities of an organisation. However trying to redefine social responsibility, would require structural change, and owners will exercise their own values, according to Weiss (1995).

The stakeholders for schools are the parent/caregivers, local community, staff and students. The organisation has a duty to disclose some information and an incentive to disclose more as they comply with statutory requirements. Some external bodies are disclosing information about educational institutions as part of mandatory and voluntary schemes (Ofsted 2003, People and Planet 2012).

The reporting of educational institutions has been accepted practice for many years, with schools audited to assess their level of care and attention to prescribed standards in management, teaching ability, pastoral care, and student attainment. The use of Ofsted for this reporting has also been extended in pilot schemes to look at sustainability issues in schools (Ofsted 2009).

From the range of theories discussed and analysed, it is apparent that, while stakeholder theory seems to encompass what a school is about (in terms of its association with the local community); there are elements of the other two theories that are pertinent to schools. There are differences in the symmetry of disclosure through the amount of information which is made available and shared by schools to the community, even of the knowledge generated, in the management and operation of a school.

3.2 Measures for Sustainable Educational Institutions

An example of the type of measure that can be used for assessing the sustainability of an educational institution is given by (People and Planet 2012) for the Green League of Universities. There are a series of measures used to assess the universities. These range from the type of policy implemented, staffing for green procurement and reducing emissions.

In the assessment it is expected that the institutions will have published an environmental policy which is made publicly available and this must be demonstrated. The policy is expected to include details of how the institution will reduce the environmental effect in each of eight areas: biodiversity, community involvement, construction and refurbishment, emissions and discharges, sustainable procurement, transport, waste management, and water (People and Planet 2012). These areas can be related to the different ‘doorways’ and other environmental measures noted earlier, that are used for schools by the DfE. These are shown and compared in a table of keywords in section 5.2.1, Table 5-8.

3.2.1 Measures of Sustainability

This research uses previous work from the literature as a template to provide a framework for the discovery of acceptable indicators or measures of sustainability applicable to educational institutions.

The use of indicators, or measures of sustainability, are powerful tools that can be ascertained from a range of different scenarios and inputs. They can help to focus attention on what sustainability means and to give a broad overview of whether we are achieving the aim to identify levels of sustainability in schools. This is shown by an observable and measurable outcome, through a standard mechanism.

A measure represents an outcome, whose values can give information about a complex system. However it may be difficult to measure some variables in a complex system, and yet it may be possible to evaluate a system by monitoring appropriately chosen indicators (Bell and Morse 2012). These can be used to determine a quality, characteristic or property of a system and have been developed at national, regional and local levels. They are central to the monitoring and reporting of progress towards sustainable development (Bell and Morse 2012).

Some key areas for measurement are in: management, curriculum, teaching, learning, decision-making, purchasing, specific projects, grounds and surroundings, and general environmental indicators (Ofsted 2003). However it has been noted that the international experience in ESD indicators have been shown to be limited and are still in their early stages of development (Tilbury and Janousek 2005).

As Bell and Morse (2012) have noted, indicators and measures may be assessed either quantitatively or qualitatively, based on a set of agreed outcomes which are a subjective feature of any system.

This analysis places a range of selected measures in a framework based on the eight ‘doorways’, and a range of other keywords which provide a comparative assessment of the different schools and their sustainability reporting performance based on the available public information. These keyword measures are discussed further in the methodology in Chapter 4.

These measures are ‘process’ indicators, where they give information about likely future outcomes. A ‘process’ indicator uses a model or working hypothesis linking the values of the outcome with the changes that occur over time of the observed system (Bell and Morse 2012).

The use of a range of measures and indicators is important to analyse the extent of the reporting of sustainability. This study incorporates features of the keywords derived from the DCSF (2008) eight sustainability ‘doorways’. There is also utilisation of the ‘nine topics’ from the Eco-Schools programme administered by the Keep Britain Tidy organisation in the UK (Eco-Schools 2012). Additionally there is another analysis used where each area of curriculum, campus, and community is addressed for an educational institution (People and Planet 2012).

Benchmarks which have been used as a measure for a few resources in schools, include, the use of water, electricity, and gas (Carbon Trust 2005). There are a range of other resources which are now under greater scrutiny in schools (Groundwork East Midlands 2011).

The schools selected for this study were analysed to characterise their level of sustainability which had been achieved. This was through utilising keywords as a proxy for the importance of sustainability issues and activities reported on their websites.

The concept of systemic sustainability is utilised as a measure of the degree of change and the approach of the educational institution, based on the accumulated data. Systemic sustainability is seen as a useful approach to conceptualise and identify the characteristics of a sustainable school and provide a framework for investigating the complexity of a school system.

The concept of measuring a range of indicators can be based around the three areas for an integrated approach: curriculum; campus; and community. They are described in the Sustainable Schools National Framework (Department for Children Schools and Families 2008). These three areas of the education sector may be seen as productive for the creation of a range of appropriate measures which can be assessed through the collection of a variety of data that is available directly from the schools, their agencies and media outlets.

3.3 Reporting Systems

For the countries in the Organisation for Economic Co-operation and Development (OECD) there is a league table of attainment listing the educational achievement for a range of measures in numeracy and literacy through the Programme for International Student Assessment (PISA) analysis and reporting (Organisation for Economic Co-operation and Development 2011). It was noted that,

> school autonomy in allocating resources tends to be associated with good performance in those education systems where most schools post achievement data publicly. This suggests that it is a combination of several autonomy and accountability policies, not just a single, isolated policy, that is related to better student outcomes. (Organisation for Economic Co-operation and Development 2011, p.2)

As has been stated from the results of this study on OECD countries, the use of some form of reporting (in this case, measures of student performance) has a beneficial effect for the school. The issue of accountability is also seen as beneficial to the student performance, as noted below:

> Autonomy and accountability go together: greater: autonomy in decisions relating to curricula, assessments and resource allocation tend to be associated with better student performance, particularly when schools operate within a culture of accountability. (Organisation for Economic Co-operation and Development 2011, p.4).

In Australia, the introduction of the 'My School' website provides a range of performance information on all the schools throughout Australia, thus allowing comparisons to be made between schools. The early responses to this initiative were negative with concerns about the effect that competitive comparisons would have on school culture and effort (Australian Curriculum Assessment and Reporting Authority 2012).

In North America, there are a range of different school systems with sustainability credentials; one is the Campus Sustainability Data Collector. This provides data to produce an index of "Cool Schools", comparing schools on the sustainability of their campus (Sierra Club 2011).

The UK has had a mixed result with some countries (Scotland, Wales and Northern Ireland) not having had performance tables for some years while in England these have been in operation for many years (McNally 2011).

Also recently the Education Swanage group (2012) has noted on their website that there is a need for more schools that can set a benchmark for outstanding teaching, with improved community engagement and local accountability. From local community feedback, representing a broad range of local interests and community groups, the case was made for a proposal for a 'Free School' (see the section 2.5.3 on schools in the UK).

In England the local education authorities receive over £35 billion per year from central government (Department for Education 2010). To gain some measure of the effectiveness of the funding, a national standard is produced which is utilised in a league

table of performance of the schools based on tests conducted on a range of year groups (Department for Education 2011).

Ofsted is the government agency given the power to ensure the inspection of schools to meet required standards. Current reporting practice for schools is undertaken by school inspectors either by Her Majesty's Inspectors (HMI), employed directly by Ofsted, or additional inspectors through inspection service providers. These are independent commercial organisations contracted by Ofsted to provide inspection services and have responsibility for the administrative arrangements for inspections. Ofsted prescribes the qualifications and experience required by additional inspectors, the initial and continuing training that they should receive, and the standards they are required to meet (Ofsted 2012).

Thus, Ofsted already exists as an external validating body, assessing the operation and function of schools to meet regulatory requirements. There are also self-evaluation forms that schools can complete, to note their operational performance in sustainability areas. The 'S3' evaluation form, is an example produced by DfE and adapted and updated versions are available to use (Department for Education and Skills 2009, Sustainability and Environmental Education 2009).

Reporting on school achievements can be beneficial in improving a school's reputation, however some studies note that there is an issue with defining the effect. There can be pupil and teacher satisfaction and increased motivation with community relationships enhanced. (McNally 2011).

There has been increased significance in the reporting over the past few years on universities' sustainability in the UK. A league table has been devised which compares all the tertiary education institutions, based on a survey of standardised questions (People and Planet 2012). While this is not suggested as a model for other educational institutions, there are interesting parallels and examples to be drawn from this, as noted in the discussion of the results in Chapter 6.

It has also been noted that over the last two decades, increasing numbers of corporations or large institutions are providing reports that are:

> aimed to demonstrate their commitment to the environment, social issues, their employees, and the community; to promote transparency and

> soliciting feedback on their performance; to respond to demands for information from a growing number of stakeholders; to disclose their efforts to build and maintain relationships with external parties; to better manage, mitigate and communicate long-term risk; to enhance or protect their reputation; (Ioannou and Serafeim 2011, para.4).

Similar results have been noted for small enterprises (Jetty and Beattie 2009, Jenkins 2010). There can be a mismatch that arises with companies that have stated certain values yet may not be perceived to have lived up to these values. This was evident in the work and comments from Ramus and Monteil (2005) on the adoption of CSR and sustainability policy.

This work highlighted the discrepancies that many organisations face between their espoused commitments and the actual policy that is implemented and acted upon. It is further noted that this 'green-washing' can be a cause of increased cynicism and mistrust; with the alienation of the public and a loss of credibility for the company (Cha and Edmondson 2006).

However, a recent research project (Piggot, Hoover et al. 2011) investigated and developed an approach, where values can be conceptually linked with sustainable practices, by relating the ethical values to real, measurable actions. There is a need for accountability to the adherence of espoused values, through adoption of measures that will ensure this approach, and overcome any disconnect, as noted previously by Piggot, Hoover et al. (2011).

There has also been a call from world-wide organisations for companies to report their effects on the costs to nature or society through more and improved 'green' accountability. There have been initiatives suggested such as the 'green economy', integrated and sustainability reporting (International Finance Corporation 2007, Jose and Lee 2007, Global Reporting Initiative 2011, Ioannou and Serafeim 2011, United Nations Environment Programme 2012).

The United Nations Environment Programme (UNEP) has developed a working definition of a green economy as one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. UNEP has implemented the Green Economy Initiative (GEI), which in its simplest form is

a green economy, that can be thought of as one which is low carbon, resource efficient and socially inclusive (United Nations Environment Programme 2012).

Any development needs to maintain, enhance and rebuild natural capital as a part of economic assets and a source of public benefits, for all people whose life and security depend on natural resources (United Nations Environment Programme 2012). It is seen that a 'green economy' is where growth in income and employment is driven by public and private investments, reducing carbon emissions and pollution, enhancing energy and resource efficiency, and preventing the loss of biodiversity and ecosystem services. Investments need to be initiated and supported by expenditure from public sources, through policy reforms and regulatory changes (United Nations Environment Programme 2012).

It is apparent that many in the corporate world understand the need to meet certain social responsibilities in their interactions with the community and in the environment, for a variety of justifiable reasons. In the conclusion to their report the authors noted that:

> The findings of our work suggest that mandatory sustainability reporting not only promotes corporate transparency, but can also fundamentally shift corporate behavior towards more socially responsible practices due to elevated public accountability on performance measures that extend beyond financial performance alone. (Ioannou and Serafeim 2011, para.12)

This would suggest that in a similar way current reporting practices for educational institutions could be improved to show the way and provide a 'good practice' example for future generations.

3.3.1 Sustainability Reporting and Corporate Social Responsibility

The extent that institutions have an influence on their surroundings is highlighted in the research covering the discourse on corporate social responsibility. The concept of the stakeholder as a participant in how and what performance a corporation is disclosing on their sustainability has become more mainstream. Sustainability reporting is seen as the practice of measuring, disclosing, and being accountable to internal and external stakeholders for organizational performance towards the goal of sustainable development (Brown, de Jong et al. 2007).

> Sustainability reporting' is a broad term considered synonymous with others used to describe reporting on economic, environmental, and social impacts

> (e.g., triple bottom line, corporate responsibility reporting, etc.). A sustainability report should provide a balanced and reasonable representation of the sustainability performance of a reporting organization – including both positive and negative contributions. (Global Reporting Initiative 2011, p.3)

As is noted by Ioannou and Serafeim (2011) the use of mandatory reporting of sustainability amongst corporations promotes transparency, and more socially responsible corporate behaviour. This is seen as due to an increase in accountability to the public of the performance data which subsumes the financial reporting, as has been noted: "… our work highlights the critical role of strong enforcement mechanisms as well as the need for credible, reliable and assured sustainability information." (Ioannou and Serafeim 2011, para.12)

What is expressed in the area of stakeholder accountability can also be transferred from the corporate world to that of a school environment, such that:

> increasing choice and opportunities, will make transparency about economic, environmental, and social impacts a fundamental component in effective stakeholder relations .... To support this expectation, and to communicate clearly and openly about sustainability, a globally shared framework of concepts, consistent language, and metrics is required. ....Transparency about the sustainability of organizational activities is of interest to a diverse range of stakeholders. (Global Reporting Initiative 2011, p.2)

This sentiment would be credible and appropriate for applying to any educational institution, as they have very similar requirements to the corporations, where wellbeing and best practice of an organisation (the school) in all aspects of its operation, is paramount.

The issue is to ensure that schools follow a nature-centered outlook aligned with the new ecological paradigm and not overly growth-focused, which as Kearins, Collins et al. (2010) states is an element of business which needs to be changed. And they go on to note that corporate responsibility in this way still appears somewhat optimistic in its outlook in an increasingly globalised economic and political context (Kearins, Collins et al. 2010).

3.3.1.1 Eco-footprinting

The concept of eco-footprints was proposed and presented by Wackernagel and Rees (Wackernagel and Rees 1996). It is an approach to account for the activities of any individual, group, organization, sector or nation by measuring the amount and type of material and resources that are used and relating that to an area of land required to provide the service or function (Redefining Progress 2012). This approach to a sustainability framework has been applied across a range of levels from individual eco-footprints to whole earth scenarios. There are aspects of this concept which can be applied to educational institutions and combined with carbon reduction and footprinting programmes (Department of Energy and Climate Change 2011).

3.3.1.2 Triple-Bottom-Line approach

The TBL approach to reporting on sustainability, as noted by Elkington (2004), was presented as a way to take account of a business operating in an increasingly complex, interdependent and yet fragile global environment.

This sustainability reporting is the integration of the social, environmental and economic dimensions as a part of the ‘triple-bottom-line’ approach to accounting and reporting on an institution's activities (Elkington and van Dijk 1999). More recently the issue of ‘governance’ has been added to the topic of reporting, where it is seen as an important part of how a company or institution operates.

It is mentioned by Jose and Lee (2007), that in a survey by KPMG back in 2002, the use of reporting practices showed that environmental information was becoming a common feature in non-industrial sectors. The KPMG (2011) report notes that CSR can be seen as complying to a moral obligation to society, however organizations now see it as an opportunity to improve performance, based on the adage of what is monitored and measured, can then be managed.

The KPMG (2011) report is based on and comments on, data from surveying a large number of international corporations. While this may be seen as different to educational institutions the policy to contract out and involve businesses in schools suggests that this style of reporting may be readily imported with the new policies where businesses are more involved with educational institutions.

As has been noted for private companies, "... they may face a different level of scrutiny than publicly traded companies, this does not exempt them from accounting for their positive and negative impacts on society, particularly in the modern information age." (KPMG 2011, p.14).

3.3.1.3 Standards for Environmental Practice

The range of standards can be an issue for a comparison of the different organisations. In the following Table 3-1 there is an overview of the range of standards that have been implemented, and their main features or characteristics.

Table 3-1 *Standards of practice*

(British Standards Institution Group 2012, European Commission 2012, International Organization for Standardization 2012)

Standards for environmental practice	Characteristics
Eco-Management and Audit Scheme (EMAS)	Voluntary, externally and independently verified, common operating principles
International Standards Organization ISO 14001	Voluntary, management of process, certifiable standard, integral part of EMAS
International Standards Organization ISO 50001	Voluntary, energy management, certifiable standard,
A range of other non-formal EMS systems	Size and sector specific, a step towards EMAS

The EMAS programme is an EU initiative designed to acknowledge that organisations are showing environmental improvement in their standards of practice. Also to recognise and reward those continuously improving on their environmental performance (European Commission 2012).

Another management practice is through the International Standards Organization (ISO) which has a range of environmental measures based on their ISO 14000 series standard (International Organization for Standardization 2012). For environmental performance the ISO 14001 will enable managers of organisations to register

environmental performance, and help identify areas for improvement. (International Organization for Standardization 2012).

Also, there is new standard for energy efficiency, ISO 50001, to manage energy performance and provide indicators for improvement. This management system is designed to facilitate organisations to systematically achieve improvements in the management of energy in terms of efficiency, performance and demand reduction (British Standards Institution Group 2012).

3.3.1.4 Standards for Reporting

The standards for reporting on sustainability practices have a wide range of systems which have been developed around the world. However, it is noted that with the development of international standards there are now less stand-alone reporting systems as they are integrated into the global reporting initiatives. This development, from the report of Jose and Lee (2007), indicates that there is now more standardisation in the reporting and disclosure of sustainability information as the market matures. The following Table 3-2, notes some of the characteristics given for a range of reporting standards and their application.

Table 3-2 *Environmental Reporting Standards*

(Jose and Lee 2007, International Institute for Sustainable Development 2012)

Standards for environmental reporting	Characteristics
Global Reporting Initiative (GRI)	World-wide framework
Public Environmental Reporting Initiative (PERI)	Voluntary scheme
Coalition for Environmentally Responsible Economics (CERES)	Corporate code of environmental conduct
Business Charter for Sustainable Development (ICC)	Voluntary, 16 principles

There has been a documented study (KPMG 2011), that for at least the past decade, it has become increasingly relevant to report the extent of the interdependency of the social, economic and environmental performance of institutions (mostly commercial or industrial corporations). The process of corporate social responsibility (CSR) has become important, as well as the end product of the report, it depends on the context of

the issues presented and the given audience or range of stakeholders it is intended to inform (Elkington and van Dijk 1999, Axelrod 2000).

The concept of CSR reporting for any educational institution fulfils the ethos of an establishment that is around for the long term. Such institutions have a commitment to be part of the community and provide knowledge, skills and guidance while accepting a share of the responsibility for the effect on the environment for a range of actions and activities that they are contributors towards.

Other terms used for this framework of reporting including CSR, are, as noted earlier, IR, TBL, and also Ecological Footprinting (EF), Environmental Social Governance (ESG) reporting (KPMG 2011). More recently the concept of IR has been gaining momentum. In the report by KPMG (2011) they note that there has been the introduction of the International Integrated Reporting Committee (IIRC) in 2010. KPMG (2011) notes that the use of IR is promoted in the world arena and it should be considered by companies round the world.

It has been noted that industry and the public sector are implicated in concerns over sustainability issues:

> Sometimes public-sector facilities contribute as much, if not more, to the community's environmental burden. If we truly want to protect our environment, health, and safety, we must begin to apply to the public sector the same standards that we impose on private facilities. (Brock 2001, p.65)

Thus it can be seen that there is pressure for both private and public sectors to meet new standards, and compile information for IR.

Other aspects for the reporting of sustainability issues, is the use of electronic forms of dissemination. Information can be made readily available to the public and can also be updated or amended relatively easily and quickly. As has been noted by the International Excellence University School of Communication (2010) Companies tend to turn their website into an online newspaper to inform not only on their CSR commitment, but also on social issues in general.

Increased use of environmental and sustainability reporting is beneficial for the organisation or institution as it indicates the level of importance that is given to this

necessary element. In educating young people to be responsible adults for a sustainable future, this can be a telling sign:

> the absence of a published corporate environmental report is very informative. Even though it does not allow us to infer that the company is environmentally irresponsible, it indicates that the firm does not consider the environment as an integral part of its business strategy. (Axelrod 2000, p5).

An example of the type of reporting characteristics is discussed further in section 7.2.2, however an example of what has been used in the corporate sphere for the screening of socially responsible businesses is given below:

> Topics … important for inclusion in a Corporate Environmental Report
> - Environmental benchmarks and goals
> - Progress towards meeting these goals
> - Emissions data
> - Regulatory problems
> - Remediation liabilities
> - Toughest environmental challenges
> - Mechanism to measure success of employees in implementing environmental practices
> - Internal communications system
> - Environmental policies and practices outside the US
> - Health and safety data
> - Requirements for suppliers to meet environmental sustainability standards
>
> (Axelrod 2000, p6).

This list of the elements of what an industry report could contain provides some insight into what may be worthwhile in an educational institution where the present and future sustainability performance may be seen as an even higher priority.

3.3.2 Educational Reporting Practice

It has been noted that institutions are increasingly required to report information about their organisation's sustainability performance through their websites. This is due to stakeholder demands for greater transparency and accountability (Jose and Lee 2007). The issue with many corporations and the tertiary sector is the level of resistance to the need for interdisciplinary, non-traditional pedagogy and the use of evaluative methods to meet the requirements of sustainable development (Springett and Kearins 2005).

Schools can be seen as an investment for the future; through education in general and the education of students in sustainability in particular. They will be involved in activities that will have long term effects based on their actions and reaction to present and future challenges. Reporting the levels of sustainable achievement for any organisation is a necessity for a range of reasons: be they to meet legislation; educational goals; or for communication and marketing reasons (International Finance Corporation 2007, Jose and Lee 2007, Ioannou and Serafeim 2011).

As has been noted previously in the literature, the OECD PISA report looks at educational attainment in a range of countries, and this shows that the best results are from those establishments that are reporting publically (2011):

> In recent years, many schools have grown into more autonomous organisations and have become more accountable to students, parents and the public at large for their outcomes. PISA results suggest that, when autonomy and accountability are intelligently combined, they tend to be associated with better student performance. (Organisation for Economic Co-operation and Development 2011, p.1).

The UK education system has a relatively high autonomy and accountability compared to many other of the OECD countries. The comparison of the countries is given in the following Figure 3-1 which shows the chart from the Organisation for Economic Co-operation and Development (2011) report on autonomy and accountability in schools.

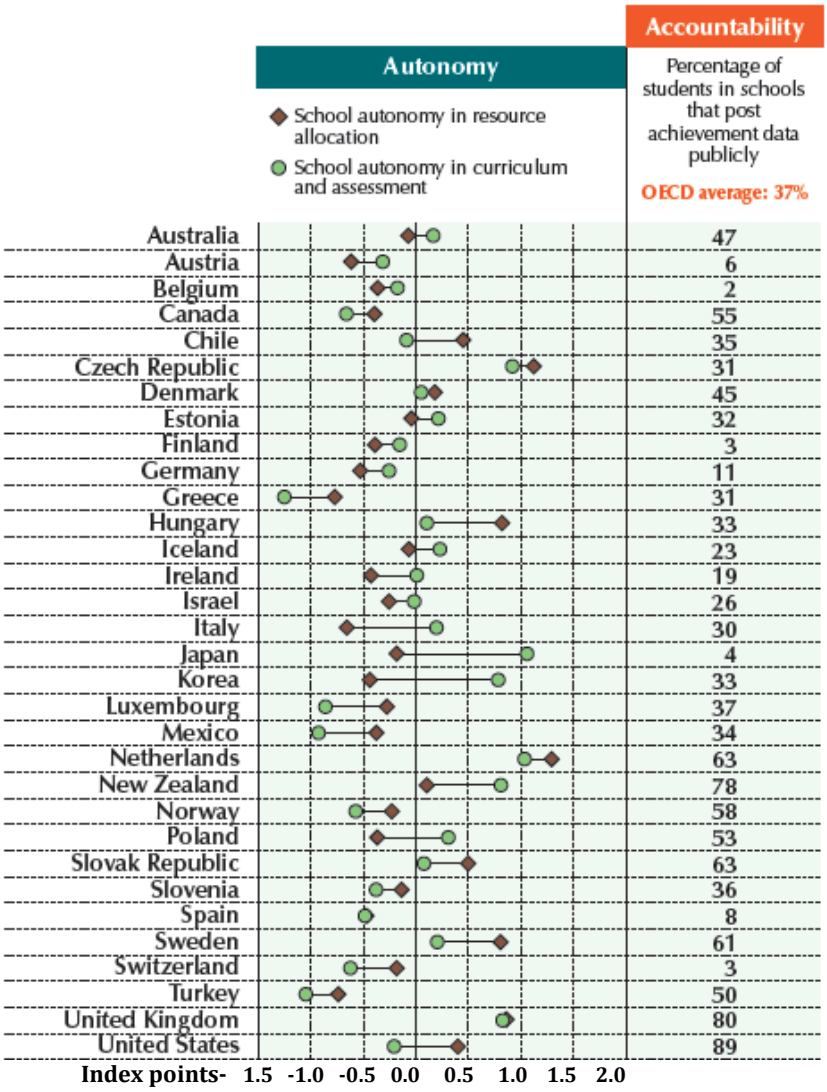

Figure 3-1 *Levels of school autonomy and accountability in countries* (OECD 2012, PISA 2009 Database)

It should be noted that positive values on the index indicate that individual schools assume more responsibility than local, regional or national education authorities, compared with the OECD average. Negative values indicate that local, regional or national education authorities assume more responsibility than individual schools, compared with the OECD average (Organisation for Economic Co-operation and Development 2011).

The schools with the greatest autonomy and those that make their achievement data publically available appear to have attained the highest performance (Organisation for Economic Co-operation and Development 2011).

There have been a range of changes proposed, implemented and discarded for performance reporting of schools in the UK and especially for England. Performance

data has been a part of the educational system in England for some years, with tables published since 1992 (Allen and Burgess 2010).

As a feature of the school accountability system the difficulties and consequences of performance tables linked to test results is an issue (Wilson, Worth et al. 2010). If such data is to be collected, much can be done to mitigate the negative aspects of their publication. It is noted that the focus of debate should be towards a discussion of the types of data and information collected and the method of presentation (The Children Schools and Families Committee 2010).

Ofsted currently inspects schools and provides a report that covers the competency of the schools to provide either: outstanding; good; satisfactory; or unsatisfactory; education. It will be another three years before these publicly available documents will be reported on again where a school has been noted as “Outstanding” or more frequently if deemed “Unsatisfactory” (Ofsted 2012).

3.4 Website Presence

The implementation of standards for websites has been in operation for many years. While there has been debate over the design and necessity for a structure there has always been an underlying protocol for the operation of the website functions and interoperability and compatibility with website browsers and different screen displays. The Graphical User Interface (GUI) is a particular area that is developed to improve the experience and accessibility of any website.

The web is used by corporations to convey their strategies and other relevant information directly to key stakeholders. However, it is not widely known if and how the advent of the web has modified the way corporations determine their disclosure strategies. From an analysis of the extent of web-based environmental disclosure, it is apparent that the web's potential as a reporting platform is not fully exploited (Lodhia 2010).

An interesting development is the increased imbedding of technology and access to information into peoples’ lives. The use of internet connectivity and accessibility has increased expectations on access and availability of information on a myriad of areas (Miniwatts Marketing Group 2012). It is noted that schools have a web-based presence

especially for communicating with the parents and caregivers of the pupils either directly, interactively or through downloadable documents.

Of the almost 31,300 schools throughout the UK, there are over 25,000 schools in England. The number of secondary schools in each LEA which have their own school website is shown to be 90% for over 175 LEAs and 100% for more than 130 of the 214 LEAs recently surveyed (Schools Web Directory 2012).

A presence on the web, for schools, is an increasingly important tool in disseminating and reporting information on and about a school. The use of this medium to report the school's achievements in a range of endeavours can be harnessed to provide the platform for IR which can be associated with the sustainability measures of the school.

3.5 Research Questions from Literature Review Two

In the literature noted in this chapter the research questions are designed to gather information to allow analysis and generate knowledge on the context of reporting sustainability issues from websites. The following questions have been derived from analysis of the topic and literature review.

Q3 To what extent can the school's statutory reporting act as a proxy for sustainability measures?

Schools are required to provide a range of data as part of their operational and educational status. There is a range of government departments and agencies which generate and provide publicly available information on schools.

Q4 To what extent are the keywords which characterise sustainability in schools evident on the selected school websites?

It is important to be able to characterise the features of sustainability in a school, and the keywords are based on measures deemed to be important by the education authorities and other interested groups as cited below. The keywords have been based on an analysis of the main documents used in disclosing sustainability issues for a range of educational institutions, based on the DCSF (Department for Children Schools and Families 2008), QCA (Qualifications and Curriculum Authority 2002), Eco-Schools (Eco-Schools 2012) and People and Planet (People and Planet 2012) reports and publications.

3.6 Summary of Literature Review Two

The review of the literature to date has highlighted the need to provide a body of research that develops the current knowledge in the use of content analysis as a tool with sustainability measures, linked to a systems approach. This provides a level of analysis of what the educational institutions disseminate through their websites, on their achievements, in the area of sustainability.

This review of the literature has highlighted the need to provide a body of research developed from the current knowledge in using content analysis, linked to systems, and using stakeholder theory to illicit measures of sustainability. This is used to perceive to what level the educational institutions disseminate and disclose their achievements in the area of sustainability of schools.

Many reports from a range of studies have shown that companies, organisations and educational institutions have the capacity and want to provide more information to validate their actions as responsible and caring members of a wider society (Jose and Lee 2007, Jetty and Beattie 2009, Jenkins 2010). The emphasis is on demonstrating the level of commitment to measures that provide evidence of sustainability in the actions of the individual members and collectively of the organisations.

The use of more appropriate reporting and management mechanisms can be argued as an important feature of this change in emphasis in a school's operational structure. This would ensure the credibility as well as accountability and transparency in their operation, management and performance. This is important for the local community as well as the pupils, staff and governors.

A new approach to reporting sustainability to the wider community is investigated. This is seen as a way to disseminate information on education and learning which is necessary for living in a way that sustains systems for future generations. This is to address the increasingly important issue of accountability and transparency in educational institutions.

The concern, which this study seeks to address, is the level of disclosure provided by the schools on sustainability achievements through their websites. Furthermore there is a need to discover knowledge surrounding whether websites and IR provides a system approach to report on sustainability successfully.

Some studies have investigated a range of websites and used content analysis to ascertain the sustainability characteristics of local government or other public departments (Jose and Lee 2007, Corina 2010, Jenkins 2010). These studies show there is a benefit in providing the disclosure of information to a range of stakeholders.

This study has analysed public information provided by the websites of specialist science schools, and appropriate agencies, to see to what extent the initiatives and aspirations for sustainable educational institutions are met. This is based on secondary schools in England, analysing the extent that science status schools disclose sustainability through their websites and other publicly available resources.

The literature review has recognised the lack of guidance or support for schools to adopt a whole system approach to reporting on their sustainability initiatives to a wider audience of stakeholders. Furthermore there is a need to discover knowledge surrounding whether websites and IR provides a system approach to report on sustainability successfully.

3.7 Conclusion of combined Literature Reviews

It is evident that there are many organisations involved in adapting the school curriculum, campus and community to improve sustainability. The participation to increase the sustainability connections and the performance of people, as human capital and their environs is measurable. The physical capital is used within the social capital of the family and the wider society. This can be included with the natural capital, where the effects of resource use need to be minimised to move towards a more sustainable level of consumption and resource use.

There is a requirement for robust measures of sustainability, based on systems thinking. This is to address the increasingly important issue of accountability and transparency in educational institutions. A new approach to reporting sustainability to the wider community is investigated. This is seen as a way to disseminate information on education and learning which is necessary for living in a way that sustains systems for future generations.

There are many developments and changes in the arrangements for funding and ownership models for all the state-maintained schools. Schools are encouraged towards new ownership and management models which are more in line with the demands of a

corporation or business enterprise. While it is outside of the scope of this study to comment on the merits of such a change in the funding and ownership models, it is important to see the benefits of a reporting system for any large consumer of resources and especially with a strong social basis in the community. This reporting needs to be comprehensive and transparent in its dissemination to the local community of stakeholders and to the wider world. This can be instigated through the greater use of an already well-utilised portal to resources; by accessing the school or government website.

In the UK, People and Planet, the student group, have implemented a methodology for reporting sustainability in universities, based on a range of features that are structural and policy based. The approach to the institution is based on the use of a questionnaire to elicit the responses (People and Planet 2012).

There are options for schools to implement many changes which could have far reaching effects on the people, the community and the wider population. Different learning and teaching experiences need to be evaluated and compared and the sustainability outcomes reported.

In the following chapter the research design and methodology for undertaking this investigation is presented and discussed. This chapter will show how the method employed will be able to answer the research questions, while addressing the hypothesis and meeting the aim and objectives of this study.

Chapter 4 Research Design and Methodology

4 Introduction

In this chapter the relevant literature has been assimilated and an appropriate theoretical approach and data collection technique and analysis methods are described and presented.

This research is based on a pragmatic framework using a mixed methods approach utilising both qualitative and quantitative data. Content-based analysis of the educational websites was undertaken using keywords to analyse selected webpages. Quantitative data is collected from government and official agency sites to provide comparative analysis of the results.

This research uses the stakeholder theory as a framework for understanding the drivers to the disclosure of information as discussed in the previous chapter. Educational institutions are seen as large organisations which play a part in the immediate community, and in many ways through their actions and activities have an influence on their stakeholders.

In this study there is an analysis of a range of public information on special science status secondary schools, using a variety of resources. This analysis examines the initiatives, activities and aspirations reported for sustainable educational institutions as sampled from the population of secondary schools in England. This investigation analyses the extent that science status may have on the schools' reporting of sustainability.

The increased privatisation and commercialisation of the management and servicing of educational institutions has increased the need for transparency and accountability reporting to the public. If the educational institutions are to retain their status in the local community, then improved interaction with their stakeholders is required.

This study involved the identification of sustainability measures and the analysis of the level of reporting that is disseminated to the public from the educational institution via its website. Rossman and Wilson (1985) stated that a focus on methods, is not the most

important aspect of research, it is the issue being studied and the questions asked about that issue which is important and this is the pragmatic approach undertaken in this research.

4.1 Summary of Sustainability Concepts Framing the Research

The significance of addressing an eco-centric compared to an anthropocentric view, within the context of systemic sustainability issues in education, needs to be addressed, while maintaining a reporting regime that meets stakeholder requirements. This supports the need for the analysis and development of the main research questions.

There is an analysis of the issues in reporting information about a school's performance, subject to accountability and transparency. There is a need identified for a system to allow fair and comparable data to be presented and scrutinised in a format and medium that is readily accessible and available to the stakeholder public (Department for Education 2012).

4.2 Research Methodology and Theories of Knowledge

This study uses a mixed methods approach, where primary and secondary sources of information and data are collected and correlated. The selection of the sample is related to the population available due to the constraints of the study using specialist secondary schools in England. The interrogation of the educational institutions' websites involves the use of content analysis based on a selection of keywords (as noted below) to identify the level and presence of an emphasis on measures of sustainability.

The use of content analysis is wide-spread as a research tool to screen the media and other material for appropriate words or phrases (Weber 1990, Neuendorf 2001).

The theoretical perspectives that are used here attempt to explain the rationale for choosing the research methodology. The overall conceptual framework acts as a working paradigm, which is adjusted to meet the changing requirements of the investigation. In effect a pragmatic logic is approached where using the powers of inquiry to gain answers to practical questions.

Information which is reported and disseminated to the public and stakeholders through the medium of the internet-based websites of the sampled schools, provides the

material on which the analysis is based. The list of schools is derived from the database of the specialist status secondary science schools for England, which is made available to the public through the DfE via their website.

4.2.1 Overview of the Research Method

The research method employed for this study involved a mixed-methods approach, where there was the collection and analysis of information from a series of educational institutions selected from a range of Government Organisations (GOs) and Non-Government Agencies (NGOs),

Educational institutions that were mentioned in public media and literature as achieving a measure of environmental and/or sustainable awareness were recorded. These institutions were then further selected, based on their specialist science status and the latest available reports and certificates of building performance (Communities and Local Government 2008).

The Display Energy Certificates (DECs) show the actual energy usage of a building, and the operational rating, which have been mandatory since October 2008. They provide the public with comparative details of the energy efficiency and water use of a building. This is based on the energy consumption of the building as recorded by gas, electricity and water meters and is required by law to be prominently and publicly available (Communities and Local Government 2008). More than eighty educational institutions fulfilled the criteria to be analysed for this study.

The selected institutions had their information gathered from publicly available reports and other sources (internet and websites) and this is undertaken to characterise and evaluate their level of sustainability reporting based on a range of measures (Qualifications and Curriculum Authority 2002, Sustainable Development Commission 2006, Department for Children Schools and Families 2008, Eco-Schools 2012, People and Planet 2012).

These measures are based on a range of variables and evaluated to characterise the most effective arrangements that would be predictive of defined levels of sustainability (data on school size, achievements, catchment area, energy, water and other resources used). These measures are noted below in the section that follows.

The data was collected and collated based on the presence of the sustainable or eco-resources at a school and how they are portrayed on their website (e.g. the words used, frequency of different types that can be related to what features the school has installed). A series of exemplar case studies were used for the comparison on the concept of a sustainable school. The parameters, which are selected, are seen as exemplars or 'Green Ambassadors' (Eco-Schools 2012) and compared with the sample of Science Status Schools.

The following section covers the areas of stakeholder theory and reporting and the use of a web presence to disclose information based on a systems approach.

4.2.2 Stakeholder Theory

As noted in section 3.1.1.3, stakeholder theory makes use of a framework where the underlying context is important to fit with the content. As a central principle of sustainable development, stakeholder participation is important. The concepts of stakeholder theory can be applied to the educational sector, transferred from the domain of the business world.

Applying this in the field of sustainable development, and to the educators and school leaders as a crucial group of stakeholders, places them with a vital role in the education of pupils about the issues in the school and the wider community.

The concept of social responsibility is seen as important for the stakeholder where they are involved in the values and norms for the school and its community.

According to Jackson (2007) there is an overall view that the school community is positive about sustainability and that collaboration with other stakeholders would address perceived barriers in a productive initiative to further the development of sustainability in schools.

The use of stakeholder theory can be a driver for a whole-school concept of sustainability to be adopted. This is important to encourage the support of all the stakeholders at an early stage (Jackson 2007).

4.3 Research Design

Sustainability is made up of a series of strands including a systems approach as part of a ‘Cord of Sustainability’. In this section further strands to investigate the reporting of sustainability are presented with the approach and method to gather and interpret the data.

As Jose and Lee (2007) have demonstrated in their investigation and reporting, there are increased expectations for organisations to provide environmental and sustainability disclosure information. Their research utilised content analysis applied to corporate websites and noted the drivers to increased disclosure. This was primarily due to regulation, although also through the need for improvement in the reputation of the organisations with their stakeholders. It is also interesting to note the importance that the website material is given and the prominence of the reports on sustainability issues (Jose and Lee 2007).

There is a pragmatic approach in this study with the use of mixed methods to investigate sustainability reporting in secondary science schools in England. This inquiry has taken a pragmatic view of data collection and analysis which has been undertaken using qualitative and quantitative techniques.

4.3.1 Instruments

Some of the features for sustainability can be ascertained from a range of different scenarios and inputs. There are characteristics and features which may focus attention on what sustainability means and whether, by using a standard mechanism, it is possible to achieve sustainable schools, through a measurable sustainability indicator.

Any indicator can be used to measure a quantity or observable value which provides information about a complex system. While it may be difficult to measure some variables in a complex system, it is possible to evaluate a system by the monitoring of a range of appropriately chosen indicators (Bell and Morse 2012).

These measures or indicators can be used to determine a quality, characteristic or feature of a system and have been developed at national, regional and local levels. They are central to the monitoring and reporting of progress towards sustainable development initiatives (Ofsted 2003). However it has been noted that the international

experiences in ESD indicators have been shown to be limited and are still in their early stages of development (Tilbury and Janousek 2005)

For the educational institutions in England, the sustainability curriculum has been defined by the Sustainable Schools National Framework (Department for Education and Skills 2006). This comprises three interlocking parts: a commitment to care; an integrated approach; and a selection of 'doorways' or sustainability themes (these are discussed in more detail in the next chapter).

An evaluation of the school material that is published and headed under these areas will be useful as a basis to match the UK government's own strategy and see how this can be analysed under the framework described below.

4.3.2 Keyword Measures

There is a range of words selected from the appropriate government departments and agencies sustainability documents. These are used to characterise sustainability issues and the origins of the terms and phrases which have been utilised in this research. Four main lists of words have been utilised for the purposes of the study from the frameworks in section 2.3. These are: Eight 'doorways' (Department for Children Schools and Families 2008); Nine Topics (Eco-Schools 2012); Eight areas (People and Planet 2012); the Guidance for Inspectors (Ofsted 2012).

These keywords are distilled down to a single list for the analysis of the websites and used as part of the content analysis method with the database of results. The table of keywords are shown in section 5.2.1.

4.3.3 Data Collection

There is a population of approximately 3000 specialism status schools, from which the sample is taken, where some 87 schools had attained the status of science specialist and were also noted as still active (Department for Education 2011).

The use of content analysis generates the frequency count for the different facets derived from the websites and other publically available material. This is collated into a database and spreadsheet, where the different features are collated and analysed for each school.

The additional data from government agencies provided water and energy information, such that where available, the DECs are shown for each school building with details on the Operational Rating and Asset Ratings calculated for each building.

Comparative data is made available through the official educational organisations, and other public sources of data which needs to be interpreted appropriately to take account of the different timeframes and sample sizes in the study.

The reliability and validation of the collected data is demonstrated by the use of an iterative process, whereby the keywords were selected and applied to the same websites by selecting a representative sample and reviewing them again. This allowed a validity check of the data and all of the data was compiled and could be checked against official documents and websites to verify the accuracy and applicability of the information on the school websites.

4.3.4 Data Analysis

The analysis of the websites, reports, literature and other material is facilitated through the technique of content analysis with the use of spreadsheet and database tools to provide the means for the collation and analysis of the data.

The use of content analysis provides the key tools for organizing the collection and initial analysis of the data. Krippendorff (2004) noted that the following questions are important for inclusion in content analysis: which data are analysed; how are they defined; what is the population from which they are drawn; what are the boundaries of the data to be analysed; what is the context relative to which the data are analysed; what is the target of the inferences.

A series of content interrogations were undertaken to assess the public information that is provided by these institutions and by third parties. Data collected is in the form of qualitative material (key words or phrases based on reports from official sources) and a quantitative basis (analysing the number and type of environmental or sustainable technologies employed or measures implemented), to obtain environmental, sustainable characteristics.

This information was gained from a variety of sources including; school prospectuses, web-sites, local authority reports and the latest national reports of official government agencies and other sites or agencies that list schools according to these characteristics.

As part of the method for collecting and collating the data and grouping into categories, content analysis is, as described by Weber (1990), the textual material which can be reduced to manageable data to reveal the focus of individual, group or institutional attention. It acquires both qualitative and quantitative data, as Weber goes on to note, that when making valid inferences from the text, the classification procedure needs to be reliable and consistent. Weber also states that, " compared with techniques such as interviews, content analysis usually yields unobtrusive measures in which neither the sender nor the receiver of the message is aware that it is being analyzed." (Weber 1990, p.10).

The use of content analysis techniques is important to validate the concept of how important the image, portrayed via the school website, of sustainability is to the school. The assumption here is that the words and phrases mentioned most often will indicate the importance attached to disclosing and reporting the details.

In this study there is identification of content from educational institutions that yield material for validating sustainability outcomes. There is an analysis of this material which has been disseminated to the public. The data which has been collected is analysed using comparable descriptors and these are also validated through the use of a selection of exemplar case studies (see Chapter 5).

The strategy for the case study selection uses the concept of a 'sustainable school', of which there are several noted. These are the 'Green Ambassadors' of the Eco-Schools Programme (Eco-Schools 2011). A case study of a sustainable school with a whole-school approach is selected from an Ofsted report, which had reviewed the school for sustainability initiatives (Ofsted 2012). This case study is also used in the comparison with the exemplars and the specialist science schools.

The following research questions have been developed from the literature in Chapters 2 and 3 and have been used as a basis for meeting the aims and providing a focus for the analysis. They are based on the initial objectives in section 1.3.

4.4 Research Questions

The questions presented below were used as a focus for the investigation and follow on from the above analysis and the methodology, which was designed to collate data to address the research overview.

Q1 How do science schools compare to other secondary schools in their attainment level?

The science schools are a subset of the secondary schools and have been chosen to elicit information to corroborate with the literature on the extent that the status for these schools will provide a better response to the reporting of sustainability.

Q2 To what extent do science schools compare to exemplars of sustainable schools in terms of the measures of sustainability?

If science schools are compared to some exemplar schools for sustainability then some level of understanding can be gained on whether they are meeting best practise as shown by the exemplar schools.

Q3 To what extent can the school's statutory reporting act as a proxy for sustainability measures?

Schools are required to provide a range of data as part of their operational and educational status.

Q4 To what extent are the keywords which characterise sustainability in schools evident on the selected school websites?

The keywords have been based on an analysis of the Department for Children Schools and Families (2008), Eco-Schools (2012), Ofsted (2008) and People and Planet (2012) main documents used in disclosing sustainability issues for a range of educational institutions.

To summarise the undertaking of the research and the derivation of the questions as noted above, it is possible to encapsulate the sequence in the following figure (Figure 4-1), which shows the relationships and linkages required to determine the data, and to address the investigation.

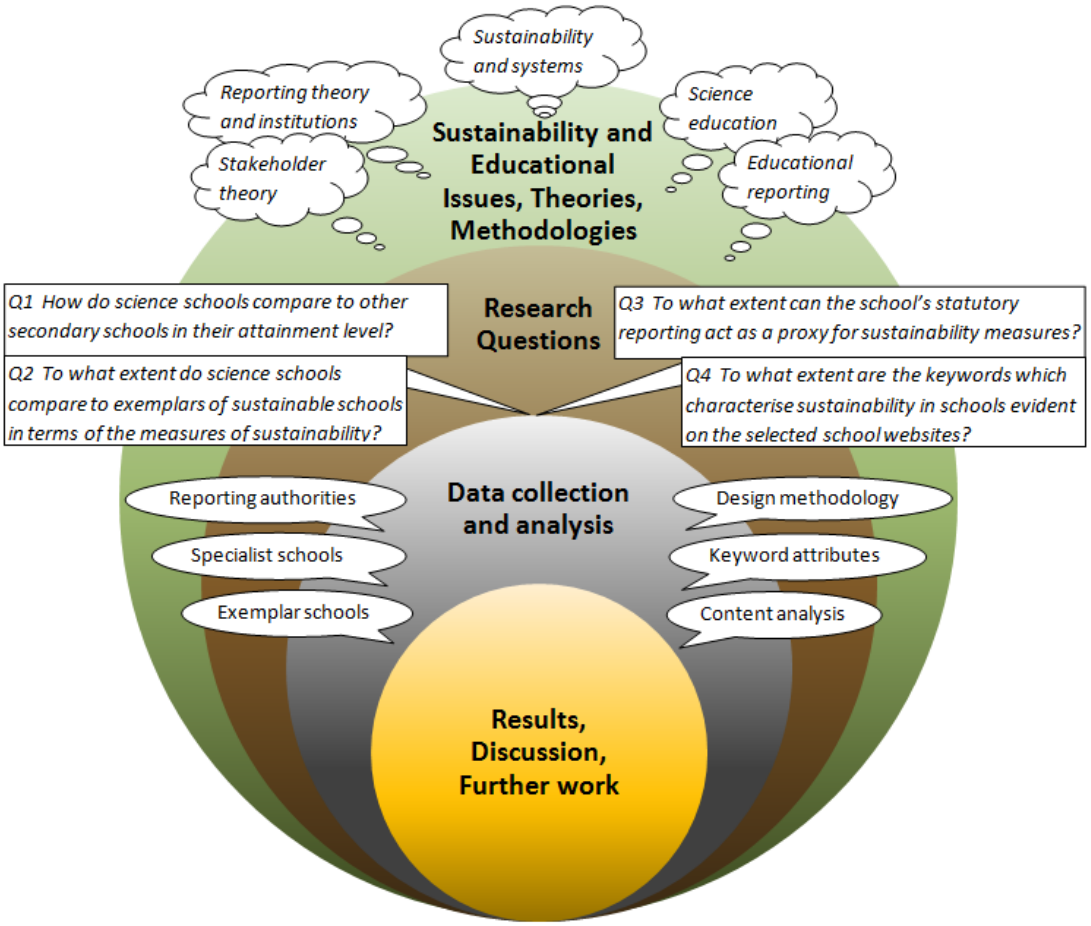

Figure 4-1 *Overview of methodology and research design for thesis questions and outcomes*

4.5 Significance of the Research

The research output from this study is of significance for a range of areas in education, government and community initiatives, at the local, national and international level.

There is little evidence in the literature of how schools are reporting their sustainability performance at all levels. This ranges from the building operations, student awareness and management practices which are reported to the stakeholders whom are affected by the actions of the schools.

The research engages with policy at the school level, through the school website information for the community of pupils and staff. Beyond the school boundary the research engages with official documentation at the local and national level. This is

through access to a range of different agencies and departments which deal with schools in the curriculum, campus and community spheres.

On an international level it can be used to provide a framework for other educational authorities and establishments to appraise their situation and within their own social and political context assess the systemic sustainability approach to reporting outcomes. This may be beneficial to enhance the learning, awareness and future-proofing sustainability awareness for the next generation of adults.

4.6 Conclusion

In this chapter the outline of the methodology was presented and the associated decision-making processes required for this inquiry was discussed with the conceptualisation involved in designing measures for this study. The use of measures and indicators for identifying sustainability features was covered, noting the use of the curriculum, campus, community context.

In the following chapter there is a series of reports on the data that was compiled to establish the basis for the evaluation of science education status and the extent this influences sustainability outcomes. Also the reporting of environmental and sustainability factors and issues in the selected range of educational institutions are compared to the different exemplar case studies which are presented.

Chapter 5 Research Data and Analysis

5 Introduction

This chapter presents the data in sequence to the research questions that have been generated through the literature review. “We are satisfied that schools should be held publicly accountable for their performance as providers of an important public service.” The Children, Schools and Families Committee (2010)

The use of the website material for the research is validated by the increased presence of the internet in everyday use, approximately two-thirds of the European countries, and over three-quarters of the UK population and North Americans access the internet, with over 80% in Australasia (Miniwatts Marketing Group 2012). There is also the associated dissemination of information by organisations on their sustainability performance (Jose and Lee 2007).

Businesses throughout the world are increasingly required to provide an environmental or sustainable policy document or meet expectations in the environmental, social and governance (ESG) domains including carbon emission reductions and energy efficiency gains (Ioannou and Serafeim 2011, Department for Environment Food and Rural Affairs 2012). There is thus a desire for CSR in organisations to attain a credible status, with measures of their achievements to meet a range of criteria. It is noted that companies need to, “turn their website into an online newspaper to inform not only on their CSR commitment, but also on social issues in general .... companies use their website to set an agenda on CSR issues they are committed to.” (International Exellence University School of Communication 2010, p20).

As noted in Chapter 4, the Research Design and Methodology was based on the use of stakeholder theory and its application from the corporate world to educational institutions. The use of content analysis was instigated as a tested method to capture the relevant information. This included the number of times, and the context for the content and terms used (although these were not weighted in any way) in describing the sustainability of the school. This collection of data was based on selected pages of information from the educational institutions and other official websites.

Further information was collated from the DEC database (Communities and Local Government 2010) with the level of energy and water efficiency ascertained for each school where possible. The details of the awards and environmental programmes that schools had obtained or ascribed to, were also sought from the schools and other websites. Additional content that was publicising the sustainability achievements of the school, pupils or staff was also obtained from a range of official websites.

It is important to note that the data obtained is an overview based on a 'snapshot' of the schools websites and represents a sample of the specialist science schools and their content which is available online.

Finally the data was collected together and presented to provide a comparative measure of the range of schools, based criteria identified earlier as characteristics to measure sustainability. The discussion on the data analysis is presented in Chapter 6.

5.1 Overview of School Data

There appears to be minimal demonstration by the school websites to the wider world, of the inclusion of sustainability concepts and issues. Where these exist, the approach of the whole school would be to make this available in the public arena as much as possible, although no access of any intranet information has been attempted. Where the information on sustainable activities in the school's operations is available, then disclosure via their website would be a viable option to provide inclusion of the whole community.

In a report that evaluated mainstreaming the Sustainable Schools programme in England, the authors, Groundwork (2009) found that schools had the idea that there was a stage at which they could claim to have reached sustainability and the schools wanted to know when they had achieved this point.

In the analysis of schools from the science specialists to the exemplars the data was evaluated to see if there were any particular characteristics that were more likely to predispose schools to having a higher level of sustainability (for example based on socio-economic background).

As noted by the London School of Economics report:

> Despite some possible stereotypes, such as the environment being a middle-class concern, the large-scale studies of environmental attitudes that we looked at show little or no evidence for differences in levels of environmental concern or knowledge between low-income and more affluent communities. (London School of Economics 2003, p.4).

However it was also noted that there is some evidence that motivations can vary depending on social class or income (London School of Economics 2003).

Similarly it has also been noted that pupils are aware of any differences in what is taught and what is in the hidden curricula. It is seen that there is a responsibility to help pupils develop skills for decision making for a sustainable future. It was noted that any discrepancy between values stated and practised will be picked up on by the pupils (QCA, 2002).

5.1.1 Schools in England, UK

The specialist schools programme has been seen as an important part of previous government plans to raise standards (Department for Children Schools and Families 2009). Nearly 90% of schools in the UK were noted as specialist colleges in one of the disciplines as shown in Table 5-1.

Table 5-1 *Secondary School Specialisms*

(Department for Children Schools and Families 2009)

Subject Specialisms		
Arts	Humanities	Engineering
Media	Languages	Mathematics and Computing
Music	Sports	Technology and Science

Of almost 31,000 schools in England, there are about 3,300 that are secondary schools. Of these secondary schools some 87 have the designation as science specialists (Department for Children Schools and Families 2009).

The system for education in the UK is provided through public and private arrangements. The state maintained schools are essentially free to the user, funded through taxation and as such provide a public service with the need to be accountable and transparent in the use of the funding. Schools have a responsibility to be leaders in sustainable practice, as they are providing the ethos and training for the leaders of the future.

More recently there have been changes to the funding arrangements where a mixed model of public and private funding for academies and Free Schools has arisen. Academies and Free Schools are independent of the local authority. They are linked to funders from a range of groups including parents, teachers, charities, businesses and others. They are funded directly from central government, similar to academy schools (EducationSwanage 2012).

The data has been collected and collated and is presented based around the four research questions. A description of the data collected from the analysis is contrasted with baseline data from recent and historical government and agency reports and records. The four research questions follow with the data analysis appended below.

Q1 How do science schools compare to other secondary schools in their attainment level?

Ofsted (2011) has data showing the level of attainment of the secondary schools inspected during 2010 – 2011 as shown in the table the level of effectiveness is based on the following descriptions of school attainment grades:

Table 5-2 *What the inspection judgements mean*

(Ofsted 2012)

Grades	Judgement	Description
1	Outstanding	These features are highly effective. An outstanding school provides exceptionally well for all its pupils' needs.
2	Good	These are very positive features of a school. A school that is good is serving its pupils well.
3	Satisfactory	These features are of reasonable quality. A satisfactory school is providing adequately for its pupils.
4	Inadequate	These features are not of an acceptable standard. An inadequate school needs to make significant improvement in order to meet the needs of its pupils. Ofsted inspectors will make further visits until it improves.

In Table 5-2, the explanation of the grading system gives a perfunctory outline of what a school has shown in terms of its performance in a particular inspection by Ofsted. This grading system has been used in this study to compare schools with their sustainability attributes and their website presence and disclosure.

There is also data available on the perceived effectiveness and achievement of schools, through an online site 'ParentView' which the Department of Education presides over. This gives all stakeholders the opportunity to comment on a school and how it has operated and provided for the pupils.

In the following Table 5-3, the effectiveness of the specialist schools (and science schools) are compared with other secondary schools for a range of attributes derived from the literature on some measures for the effectiveness of schools' operations..

Table 5-3 *Overall effectiveness of schools 2010/11*

(Ofsted 2012)

	Overall effectiveness judgement (percentage of schools)			
Schools/Topic	Outstanding	Good	Satisfactory	Inadequate
All Secondary schools	20	39	34	7
All specialist schools	15	39	38	8
Science specialism (76 inspected)	16	46	29	9
Healthy lifestyles	15	66	19	0
Resource effective to achieve value for money	14	38	40	8
Pupils' achievement and enjoyment	13	50	29	8
Extent pupils contribute to the school and wider community	30	54	17	0

It can be seen that science status schools have a higher number in the 'Good' category with a lower number in the 'Satisfactory' category, compared to all specialist and secondary schools. In Figure 5-1, below, the bar charts provide an overall assessment of the selected attributes and school type.

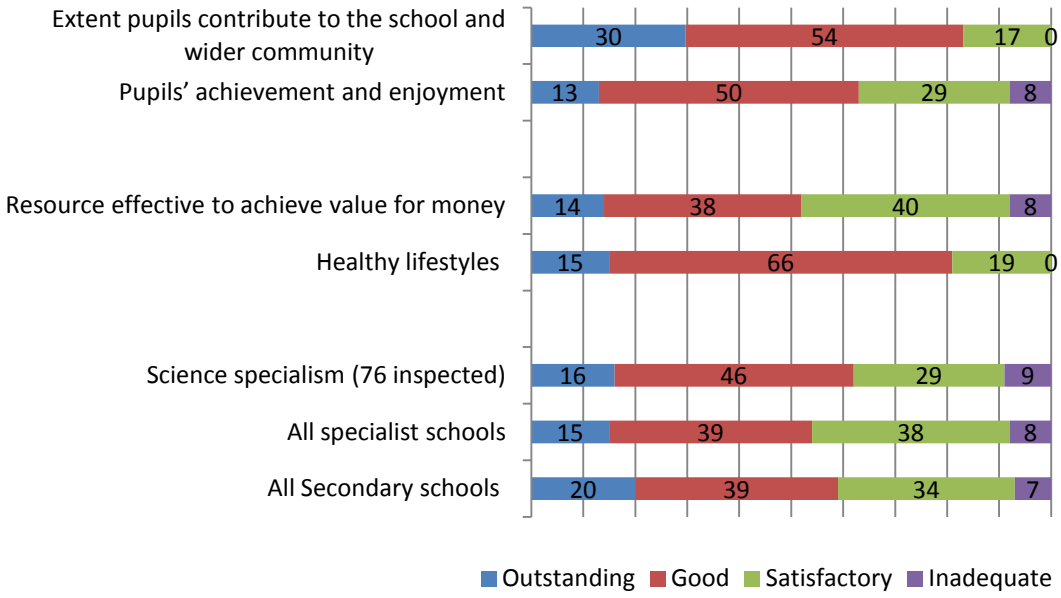

Figure 5-1 *Percentage in each assessment category according to topic/school*

(Ofsted 2012)

The following Figure 5-2 provides a bar chart of the data and the presence of 'Healthy lifestyles' is prominent in the 'Good' schools with some two thirds in this category.

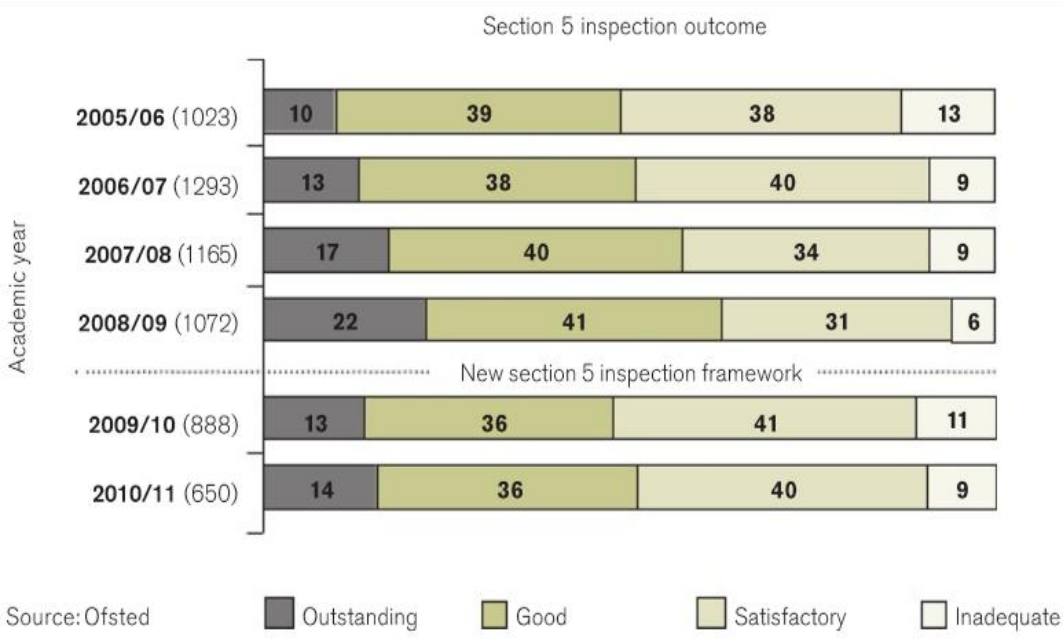

Figure 5-2 *School effectiveness judgements by academic year*

(Francis 2011, p.12)

The data and the figures from the Ofsted Annual Report (2012) show the following trends for the schools that were inspected. In the chart, Figure 5-3, there is shown the

secondary school figures for a single year (September 2010 – August 2011). More than half of the secondary schools achieved at least a ‘Good’ assessment, with 14% gaining the ‘Outstanding’ achievement. However, 57% of all the schools that were inspected in England, were assessed as at least ‘Good’ however there were a quarter less assessed in the ‘Outstanding’ category.

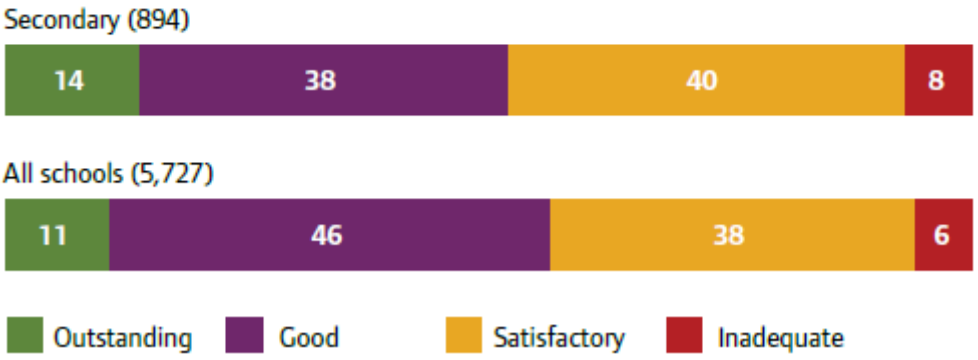

Figure 5-3 *Secondary and All school assessment 2010/11*

(Ofsted 2012)

In the next chart (Figure 5-4), figures are provided for the years from 2005 – 2011, where the level of attainment has trended down over the last few years, while the ‘Outstanding’ and ‘Good’ categories together total less than 60% of the schools. This has occurred since the implementation of the revised Ofsted Section 5 inspection framework which has significantly raised the level of what is expected from schools, as shown in the chart below.

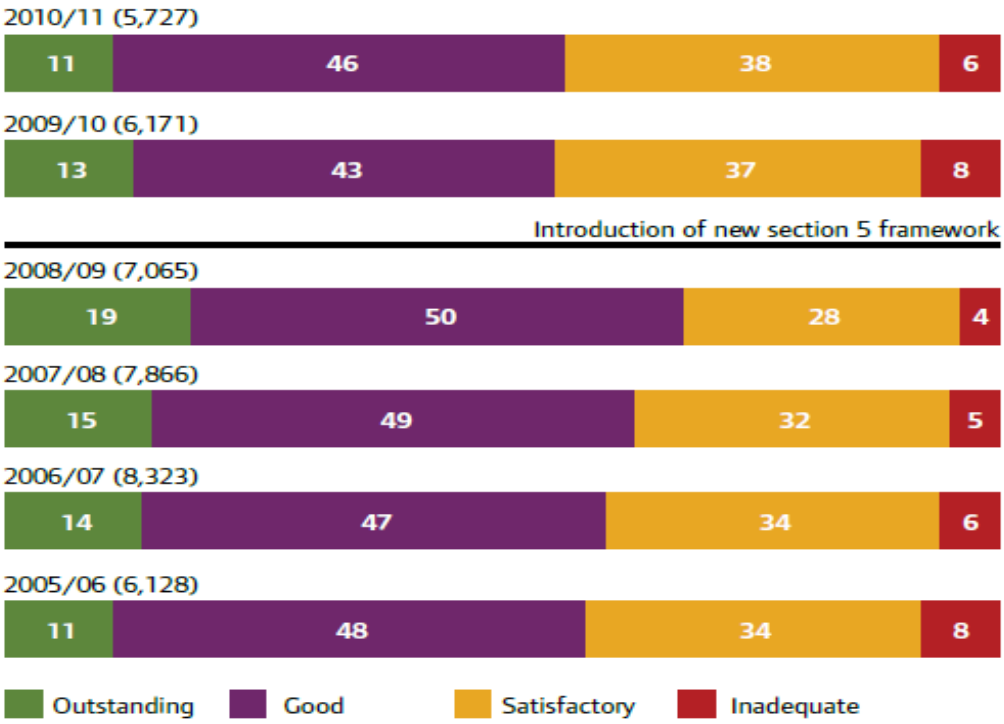

Figure 5-4 *All schools assessed in 2005-2011*

(Ofsted 2012)

The information on the school attainment based on the (Ofsted 2011) inspection reports shows that the science status schools have attained a higher level in the grades 1 and 2 compared to the overall secondary schools.

Q2 To what extent do science schools compare to exemplars of sustainable schools in terms of the measures of sustainability?

The sustainability measures of the selected sample of science schools are presented in the table below with a comparison from the exemplar schools.

There is a range of exemplar schools listed due to their prominence from gaining an environmental or sustainability award as noted in the Ofsted reports (Ofsted 2012). There are also examples selected from the Groundwork studies (Groundwork 2009), NCSL reports (Jackson 2007, National College for School Leadership 2011), and other literature and website sources. Some of the features of these schools are given in Table 5-4 below.

Table 5-4 *Exemplar Schools' characteristics*

(Data compiled from case studies)

Exemplar School Characteristics	School type	Eco-policy	Eco-school awards	Eco group	Web site	Other media	No. of Keywords
Long Eaton	Academy	Y	A, GF, H	Y	Y, L	V, N	>100
Ringmer	Academy	Y	A, ASH	Y	Y, L	V, N	>100
St Christophers	Private	Y	GF	Y	W, L	V, N,	>100
St Francis of Assisi	Faith Academy	Y	GF, H	Y	W, L	V, N, Y	>100

Note. A = Ambassador. ASH = Ashenden award. GF = Green Flag. H = Healthy Schools. L = link in website N = Newsletter V = Video W = web pages Y = Yes

Comparing the overall level of reporting from the science schools, which was low; to the exemplars which was variable, there is no real significant difference noted. This is partly due to the low numbers of exemplars available and the low priority that any school is placing on the reporting of their achievements and activities in the area of sustainability and environmental matters, as evidenced by the lack of website presence (noted in section 5.3).

Q3 To what extent can the school's statutory reporting act as a proxy for sustainability measures?

To elucidate some idea of the potential for such a proxy, it is useful to assess the availability of educational information and the range of metrics it may include. Data is collected by the Local Authorities and the Department of Education on a broad range of metrics from the overall number of students and schools to detailed financial information (see 5.1.2), to infer the status of the schools (Department for Education 2012, Department for Education 2012). Some examples of these are:

- in January 2011 there were around 8.1 million pupils (headcount) in all schools in England
- In 2011 there were 3.3 million pupils in state-funded secondary schools
- There are 3,300 state-funded secondary schools

- In state-funded secondary schools 15.9 % of pupils were known to be eligible for and claiming free school meals (FSM)
- In state-funded secondary schools 12.3 % of pupils' first language (compulsory school age and above) was known or believed to be other than English (ESL – English as Second Language)
- In state-funded secondary schools the average size of classes was 20.4 students

(Department for Education 2011).

The range of data providing more in-depth information on all schools is available to the public from multiple sources, be that the Department of Education, Ofsted, Local Authorities and other local, regional and national agencies gathering educational institution and sustainability related data.

The above data and details from the Local Authorities and the Department of Education can be compared to the sample of science status secondary schools under analysis in this study. The following comparison of selected characteristics is shown in Table 5-5 below.

Table 5-5 *Comparing selected science status and all secondary schools*
(Edubase2011)

School Type - Number	FSM (%)	ESL (%)	Average class size
Secondary schools - 3,300	15.9	12.3	20.4
Science status - 89	15.8	17.4	15.5

Note. FSM = Free School Meals. ESL = English as a Second Language

This shows that science secondary schools have smaller classes on average compared to all secondary schools; while their FSM (free school meals), a measure that has been used as a proxy for deprivation, although with some contention, this has a value which is not significantly different (Hobbs and Vignoles 2007). There is just over 5% difference for the ESL values, although this equates to the science specialisms having about 1.4 times as many second language students compared to data for all the secondary schools.

5.1.2 School Financial Data

The educational institutes' income and expenditure data is gathered by LA maintained schools in England and is provided to the Department for Education. The LA maintained schools' data is made available in the form of Consistent Financial Reporting (CFR) returns. This data shows school income and spending for the year by all maintained schools, with schools responsible for their own CFR returns. In practice, many work closely with their LA on their return before it is submitted. LA may have also agreed to work with schools and prepare and submit the returns on their behalf to the Department.

The tables of financial information allow a comparison to be made on the expenditure of the government funds and other income administered by schools (Department for Education 2011). This gives the parents, caregivers and the wider public the level of transparency on the use of resources, and it provides the stakeholders the possibility to compare the spending of schools in their local area. The ability to access this information provides help with questions on the efficiency of their local schools in gaining best value from their operations and administration of all their spending.

The table shown below provides selected information from the 2011 spend per pupil data for the schools on average and the subsets of secondary schools and the average for the specialist science schools that have been the subject of this enquiry.

The analysis of this data indicates that there is a range for each group which is of an order of magnitude from the highest to lowest values. For the science status sample there are annual water costs available giving figures for the costs per pupil, and similarly for the energy data, and is derived for the science schools and compared with figures derived from an analysis of the 2004 survey of schools as shown below.

Table 5-6 *Comparison of selected financial information*

(Compiled from the Department for Education (2012)

Schools (costs per pupil)	Water annual costs (GBP)	Water costs per pupil (GBP)	Energy annual costs (GBP)	Energy costs per pupil (GBP)	Spend per pupil (GBP)
Secondary (maximum)	n/a	15.77	n/a	64.75	n/a
Secondary (average)	n/a	7.84	n/a	41.00	5,350
Secondary (minimum)	n/a	3.72	n/a	26.28	n/a
Science status (maximum)	45,435	9.29	217,391	348.80	12,365
Science status (average)	12,893	2.40	86,356	87.12	5,542
Science status (minimum)	2,147	0.34	24,195	25.50	4,408

Notes. GBP = British pounds. n/a = not available

The data provided here (Table 5-6) gives a comparative view of a range of costs for schools for their water and energy use and associated spend. It is evident that there is a difference between the Science Status minimum value and the Secondary minimum value, where the Science schools are one tenth less expensive for water; on average are a third less expensive and at the maximum values are less than half the cost of the Secondary schools overall.

5.1.3 Energy and Water Data

Figure 5-5 below, presents the range of costs for the primary and secondary schools' data from the DfES (2004) survey. Extrapolating from this survey data to more recent years this provides an historical perspective for use as a comparison with other measures, although there is a degree of unreliability due to the age of the data that has been accessible and readily available through the Department of Education website.

IF YOU ONLY DO ONE THING, EDUCATE THE STAFF AND CHILDREN TO TURN OFF WATER AND ENERGY USING APPLIANCES WHEN NOT IN USE!

How Do You Compare?

On average, schools spend almost £6 on energy and water for each square metre of floor space. The chart below shows the range of performance for primary and secondary schools.

	ENERGY PER PUPIL*		WATER PER PUPIL*	
	Primary	Secondary	Primary	Secondary
Highest 10%	£51.87	£64.75	£15.93	£15.77
Highest 25%	£38.98	£51.05	£11.36	£11.45
Average	£29.08	£41.00	£7.98	£7.84
Lowest 25%	£21.93	£32.79	£5.67	£5.38
Lowest 10%	£16.46	£26.28	£3.97	£3.72

Figure 5-5 *Costs for energy and water*

(Department for Education 2012)

While these costs are from a booklet for schools to download from the DfE to encourage efficiencies and savings, it was also noted that some schools had greater scope for savings than others as, overall, more than 20% of energy was wasted. Through the use of some simple and easy energy efficiency and maintenance standards a reduction in fuel bills of about 10% could be achieved according to the booklet (Department for Education 2012).

The Energy Performance Building Directive (EPBD), from the European Commission (EC), requires buildings to have prominently on-show a Display Energy Certificate (DEC) as presented in Section 2.5.5.2. The EPBD is designed to help drive change and a reduction in energy use and improved efficiency to reach certain targets and levels of performance to show a reduction in output of carbon emissions (shown as CO_2 equivalent) through reduced demand for energy for heating, cooling, lighting etc (EC 2010). The DEC also provides information from previous years to show the trend or changes that may have occurred.

Wherever possible a DEC has been obtained for the specialist science schools, and the results are given in the Table 5-7, given later below.

The information on the performance standards of the buildings is one attribute that fits within the 'doorways' framework. Each institution is compared against the benchmark standards as provided by the government agencies as shown below in Figure 5-6.

Benchmark	Statistical meaning	Fuel/sqm (kWh/sqm)	Elec/sqm (kWh/sqm)	CO2/sqm (kg/sqm)
Best Practice	15% of schools did better than this level	79	23	28
Good Practice	25% of schools did better than this level	103	27	35
Typical	50% of schools did better than this level	144	33	45
Bad Practice	75% of schools did better than this level	190	42	56

Calculated March 2005, using data from FY 1999/2000

Figure 5-6 *Benchmark figures for secondary schools*

(Carbon Trust, 2005 Benchmark figures for secondary schools - calculated from DfES data for 14200 schools for the financial year (FY) 1999/2000)

The information supplied by the DfE, in its explanatory briefing sheets, covers a range of topics including energy and water costs on a per pupil basis, as indicated below, and these are used as a comparison to the science school data in this study.

The information available from a 2008 footprint study estimation was that the school estate in England emits 8.5 million tonnes of carbon dioxide equivalent (CO_2) each year (Sustainable Development Commission 2008).

From the analysis of the data on the DECs it can be seen that there is a wide range in the ratings for the energy performance of the buildings used by these educational institutions. Ratings from a poor "G" to the average "C" are apparent, with the tabulated numbers shown below in Table 5-7.

Table 5-7 *Energy and CO_2 ratings for selected science schools*

(Landmark Information Group 2012)

Energy Rating Band	Operational range	No. and (%) in each category	
A – best	0 – 25	1	(1%)
B	26 – 50	1	(1%)
C	51 – 75	9	(12%)
D	76 – 100	22	(30%)
E	101 - 125	15	(21%)
F	126 – 150	7	(10%)
G – worst	Over 150	18	(24%)

A graphical presentation of the data for the different buildings at the science status schools under scrutiny is shown in Figure 5-7 below, which illustrates clearly the most frequent rating, a grade 'D', for almost a third of the buildings.

However there was 85% of the school buildings rated below the average of a 'C'. The data also shows that there were almost a quarter of the buildings only able to attain the worst Energy Band rating of a 'G'.

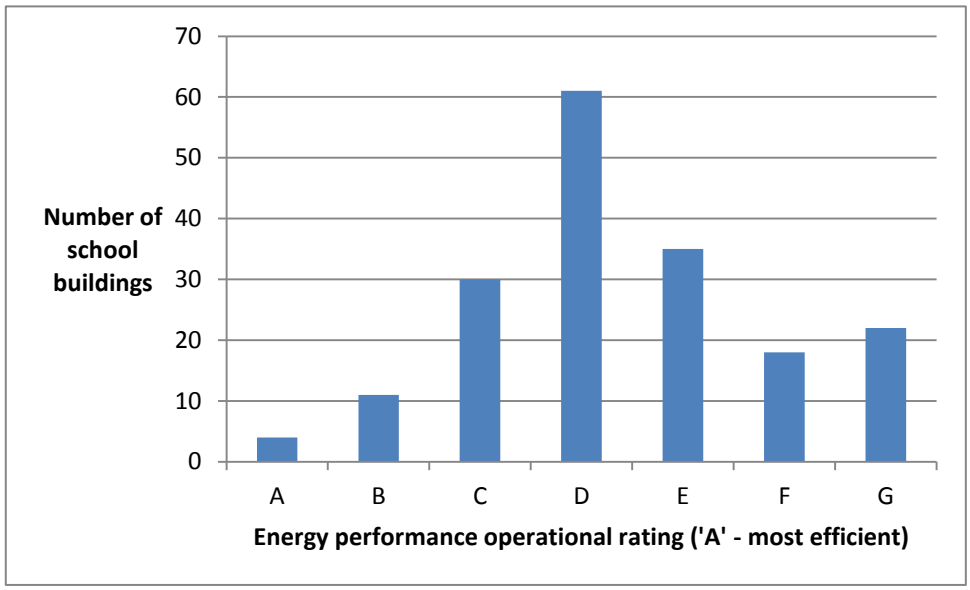

Figure 5-7 Selected science school buildings energy performance ratings

(Landmark Information Group 2012)

Similarly for the carbon emissions of the schools, this is as shown below in Figure 5-8 *CO_2 levels for designated science school buildings*.

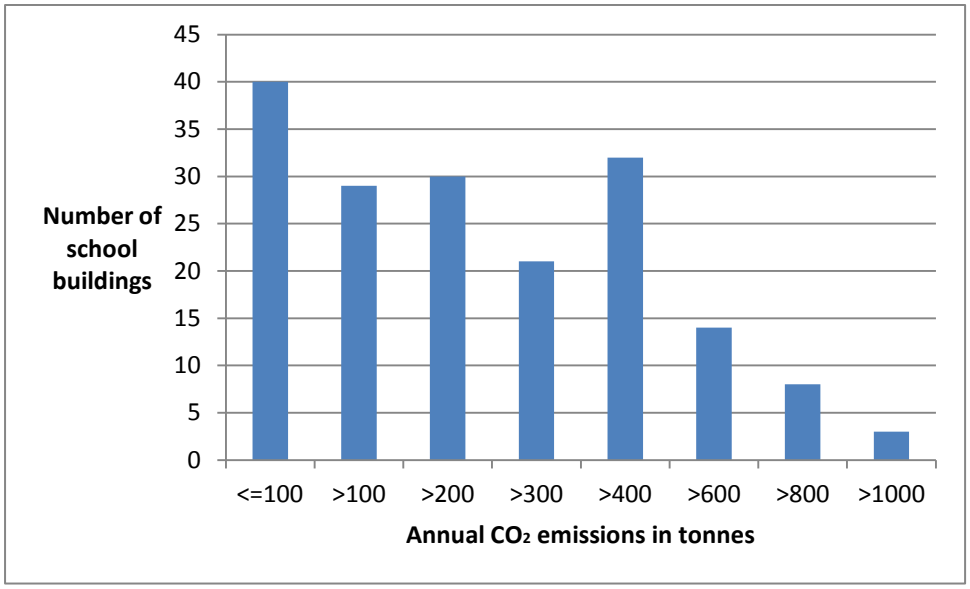

Figure 5-8 *CO_2 levels for designated science school buildings*

(Landmark Information Group 2012)

This shows that most school buildings are below the 500 tonnes of carbon dioxide emissions. Although this is a level which is relatively high for the type of activity and processes that go on in this sector: education in a school.

Also from this data it can be seen that 62 (72%) of the 73 DECs issued have an energy rating that is less than a “C”. Even if initiatives to refurbish all secondary schools were to be fully implemented and the standards maintained, there would still be many schools unable to attain one of the sustainability ‘doorway’ goals.

The SDC (2008) completed a study for the DCSF on the carbon emissions from schools. The report covered primary and secondary schools in England and looked at the carbon dioxide emissions from four main sources:

- The use of energy in school buildings
- Pupil and staff travel, and school transport
- The supply chain activities of companies producing goods and services procured by schools
- Waste management and minimisation by schools

In this study they reported the data for 2004 which is presented graphically here (Figure 5-9 and Figure 5-10) as typical data for educational institutions.

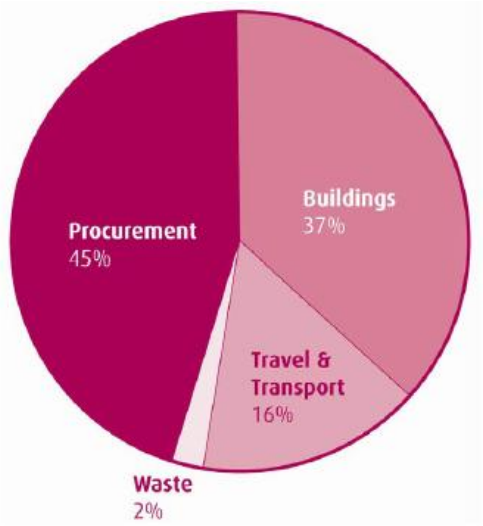

Figure 5-9 *2004 GHG emissions from school estates in England*

(Sustainable Development Commission 2008)

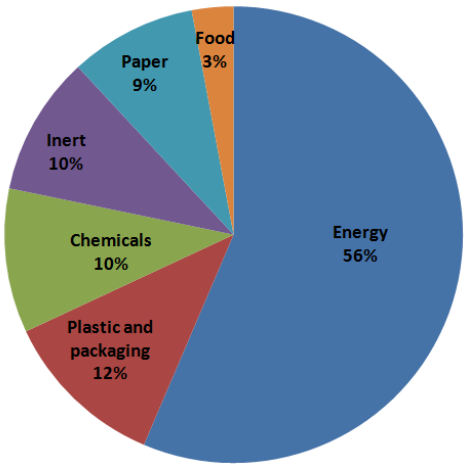

Figure 5-10 *GHG emissions by material in schools*

(Source: SiENA 2001)

Comparing the data from the SiENA (2001) report with the SDC (2008), it can be seen that energy in the form of transport is less than half that used for buildings, and that the procurement of goods has the greatest GHG effect.

Where available, data has been obtained from the 2012 performance tables. Also some of the data has been used from the 2011 performance tables provided through Edubase (Department for Education 2012). Some of the schools; data has not been available for the latest reporting period, this has been due to the schools converting to academy status, and not having had a recent report under their new entity and with the changes in administrative arrangements through the DfE.

5.1.4 Eco-schools and similar programmes

There are almost 17,000 schools registered as Eco-Schools in the UK, of which almost one tenth have attained Green Flag status. There are more than 5000 schools that have attained a Bronze award, and less than 5000 that have gained Silver award status.

There are almost 400 schools in the UK to hold two or more Green Flags, although only around 60 of them are secondary schools. Of these secondary schools, 10 are science specialism schools which have gained Green Flag status (Eco-Schools 2012).

The Action Plan suggested by Eco-Schools includes a section that looks at providing information to all the schools and all their shareholders. For one school the action was to cover “Green Issues and Sustainability” with information provided to the school through a new notice board and a new page on the school website.

The uptake of Enviroschools in NZ in 2011 was approximately 28% of all the schools. The data shows that of almost 900 schools participating in the network, about a 1/4 of them are secondary schools (The Enviroschools Foundation 2012). The statistics also show that the uptake of the programmes has spread throughout the range of different socio-economic groups (deciles) although as the graph shows there is a slight skew towards the higher decile groups.

The NZ Ministry of Education defines deciles as indicating the extent to which the school draws its students from low socio-economic communities. The ‘decile 1’ schools are based on 10% of all schools with the highest proportion of students from low socio-economic communities; whereas the ‘decile 10’ schools are the 10% of schools with the proportion of highest socio-economic students (The Enviroschools Foundation 2012).

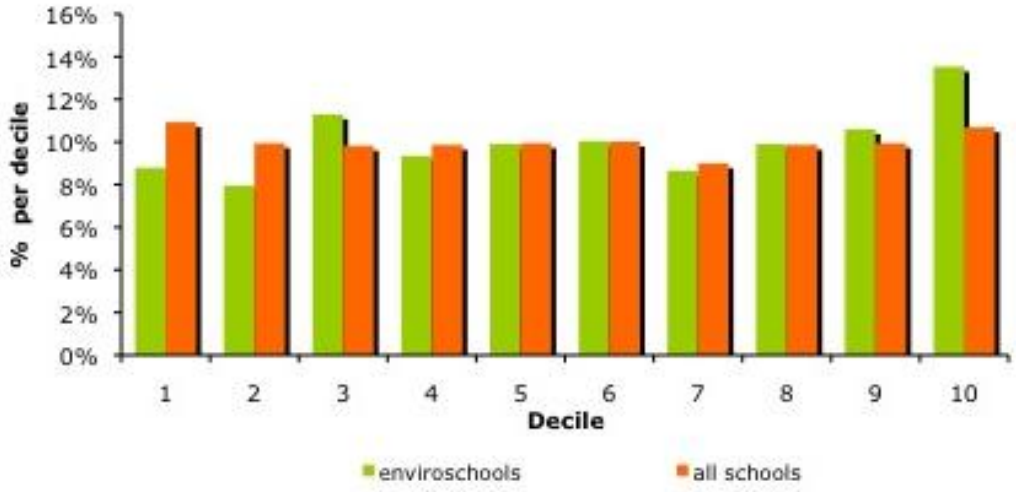

Figure 5-11 *All schools and enviroschools per decile in NZ in 2011*

(The Enviroschools Foundation 2012)

The graph shown, in Figure 5-11, illustrates the spread of deciles and the percentage of Enviroschools distributed within the deciles. This shows that overall the majority of the schools are across the range of deciles although there are a few percent more in the highest two deciles and an anomaly in the trend for the third to lowest decile.

A discussion on the comparison of this data with the experience in England with the Eco-Schools programme is instigated in Chapter 7.

5.2 Content Analysis Data

The technique of content analysis uses a set of procedures to make inferences about text and keywords (Neuendorf 2001). This technique is a useful research method for analysing the resources on the website, other literature and material which is under scrutiny as the collated data (Krippendorff 2004).

The information collated for content analysis has the categories of words, phrases and other units of text classified in similar categories for their meaning. This technique was used to elicit any common attributes associated with what are perceived to be higher achieving schools and their level of sustainability as assessed by a range of measures.

These measures are developed from the government initiatives on sustainable development indicators for schools for a sustainable future (Qualifications and Curriculum Authority 2002) and for school assessment (Ofsted 2008) and were adapted and validated for the purpose.

The use of content analysis was undertaken to define the area of interest shown by the schools from an investigation of the use of selected websites. The collection of this data is problematic due to the ability to define the boundaries for the collection from school website pages and other media. Where searches have been limited to individual pages, they were unable to select keywords from newsletters or media releases that were in picture, photo or PDF format.

This required individual analysis of each page or picture that was accessible on a website. The compilation was not feasible in this instance and other methods of collation and corroboration of statistics on the science and exemplar cases and control schools were sought through the use of keyword data as described below.

5.2.1 Keywords Data

Q4 To what extent are the keywords which characterise sustainability in schools evident on the selected school websites?

The selected keywords are derived from the main topics and areas of common overlap from the four different organisations involved in providing sustainability measures

In Table 5-8 below, the keywords are presented as described and given in section 4.3.2.

Table 5-8 *Keywords selected for content analysis*

(Department for Children Schools and Families 2008) (Eco-Schools 2012) (People and Planet 2012) (Ofsted 2012)

8 Doorways (DCSF)	9 Topics (Eco Schools)	8 Areas (People and Planet)	Guidance for Inspectors (Ofsted)	Key Words Selected
-	Biodiversity	Biodiversity	Biodiversity	Biodiversity
Inclusion and participation	Global citizenship	Community Involvement	Sustainable	Sustainable, global
Buildings and grounds	School grounds	Construction, Refurbishment	BREEAM EMS	BREEAM, EMS
Energy and water	Energy	Emissions, Discharges	Energy, climate	energy, climate
Purchasing Food and drink	Healthy Living	Sustainable Procurement	Healthy resource	Health
Travel and traffic	Transport	Transport	Travel	Travel/transport
Waste	Waste, Litter	Waste Management	Waste Recycling	Waste, recycle
Water	Water	Water	Water	Water
-	-	-	-	carbon, green, ecological, environment

The selection of words used in compiling the table of keywords for the investigation of websites was a pragmatic approach to instigate a probe of what information was available. The grounding was based on the previous literature reports which provided a

range of terms which had been used in common discussion and interaction with schools and other educational institutions.

The reports produced by Ofsted are made publicly available and communicated via a database accessible through their website (Ofsted 2012). Most of the schools make these reports available through their websites.

All schools provided a link to the latest copy of their school inspection report via a link to the Ofsted website or provided a link to an electronic copy in a Portable Document Format (PDF) format on their own website. Other documents were also available in a similar way to publically access information through Newsletters, a school Prospectus or special event announcement connected with the school. There was also information on the types of clubs and activities that were undertaken by the school, communities and other groups working with the school in an educational or promotional role.

The following table (Table 5-9) notes the range of terms used by the different schools for the groups and students involved with the Eco-Schools programmes.

Table 5-9 *Terms used by eco-clubs in schools*
(Data collected from websites)

Terms used for group members	Terms used for school groups
Eco Reps	Eco-club
Eco-saviours	Eco-group
Eco-warriors	Eco-matters
	Eco-squad
	Eco Team
	Team Green
	Team Eco

It is interesting to note that there is quite a range of names used for the different groups representing the activities related to sustainability and ecological issues. The number of names identified for the members of the groups is relatively small in comparison. No

thesis on why this may exist is put forward from the preliminary analysis of the data, due to the small sample of schools and groups overall.

5.3 Website Assessment

The use of websites as the resource for the investigation and collection of the primary data can be problematic. The pages available on the web, unlike publically printed material, are ephemeral in nature, as they can be changed and removed at any time. Conversely to this, the material can be timely and updated periodically to keep people informed on new developments, and is easily accessible locally, nationally and internationally, given the requisite access equipment.

There is a range of levels achieved and noted on the different school websites for the reporting of information related to sustainability activities. Some of the schools provided an accessible and searchable range of resources relating to the different actions and activities which would be associated with environmental or sustainability issues as characterised by using the keyword selection. Some schools were participants in a range of schemes or actions yet did not explicitly present this in an accessible or readily identifiable manner for easy discovery.

Of the schools with Green Flag status, there were over 50% that had used the keywords on their website, using the sample of pages that were investigated.

From the selection of keywords, the last column has an extra row of words that were also selected as representative of the key words for the content analysis of the secondary school websites. The range of pages accessed from each website was initially selected, based on common pages, which was assumed that all the schools provided, as shown in Table 5-10.

Table 5-10 *Selected web-search pages*

(Collated from the science specialist school websites)

Web-pages and headings for keyword searches		
Home page	About us/ Heads' welcome	News/latest newsletter
Prospectus	Curriculum/specialism	Activity/club/group
Aims/ethos	Eco-school policy	Environmental/sustainability

The initial use of a range of keywords sought from defined pages of a website does give an insight to the significance and placement of the material in the hierarchy of the school's information dissemination process. However, the results of this measure are currently not tested and give only a precursory insight into the schools' ethos and values towards the sustainability measures. Any pictures were not counted and the accuracy of any listing was not ascertained, nor was any weighting given to any use of a particular keyword (see Wilmshurst and Frost (2000) for further discussion on these issues).

The following keywords listed in Table 5-11 were searched for at different levels throughout the schools' web-pages, taking into account the context of their use as it related to environmental or sustainability issues.

Table 5-11 *Keywords sampled*

Selected keywords			
Ecological	BREEAM	Biodiversity	Health
Environment	Carbon	Climate	Recycle
Sustainable	EMS	Global	Waste
Travel/Transport	Energy	Green	Water

The keywords were inserted into the find utility command on the following website pages or equivalent areas (see Table 5-12). This was completed for each of the specialist

science schools and also for the comparison with the exemplars and case studies that were undertaken as part of the investigation. These ranged from the first page reached on the school's website (usually a home page or welcome page), to a search for clubs and activities which may have details found in newsletters or extra-curricula activities pages.

The list of areas for the planned search, (as noted previously in Table 5-10 above), was amended to encompass the websites encountered in the data collection stage of the investigation, as is shown in Table 5-12 below.

Table 5-12 *Key website pages*

Web-pages and areas searched		
Home/About us/Information	News/letters/Events	Curriculum/Specialism
Heads' welcome/Introduction	Awards/Events	Activities/Clubs/Group page
Aims/Ethos/Policies/Values	Prospectus/Statement	Environmental/Sustainability

From the data it is evident that no schools had a front page tab that linked direct to information on sustainability. One exemplar school had a menu about the school that contained a drop-down list which then linked to a sustainability page. This would suggest that sustainability is not high on the priorities for the website content.

The schools that have obtained the Eco-Schools status have access to a logo which is usually applied to the front/home page of the school website. Other measures of their commitment to sustainability is the Healthy Schools programme, which also provides a logo for the promotion of a school's status, which is usually shown on the school's website.

The database of information available on the Eco-school website shows that there are predominantly Primary schools registered and gaining the Energy Award. None of the Specialist Science schools were listed. This information is displayed in the following table (Table 5-13), which shows slightly more science specialist schools were registered compared with all schools.

Table 5-13 *School types, number and range of Eco-awards*

(Eco-Schools, 2012)

Type of School	Registered Eco-schools	Green Flag Status	Energy award
All	17000 (70%)	1700 (10%)	69 (3%)
Primary	n/a	n/a	60 (87%)
Secondary	n/a	60	9 (13%)
Science (SS)	65 (76%)	10 (17%)	0 (0%)

Notes. SS = Specialist School n/a = not available

The following Table 5-14, gives an indication of the numbers and types of schools that had obtained the highest status of Ambassador through the Eco-school programme.

When compared to the total number of schools these are very small numbers and perhaps indicates the extra work required to gain this status compared to other options for the best use of staff resources and school time.

Table 5-14 *Type and number of schools for two years with Ambassador status*

(Eco-Schools 2012)

Ambassadors in	Primary	Secondary
2011	12	2
2012	16	4

5.4 Exemplar Case Studies

It is interesting to note that the refurbishment of an iconic building in New York City (the Empire State Building), has managed to change its operational functions with improvements in glazing, insulation and heating and cooling such that they now provide a tourism feature of the environmental and efficiency improvements. As noted below and

displayed in Figure 5-12 there is a large display of presentation boards and examples of the improvements made in the efficiency and operational improvements.

Figure 5-12 *ESB refurbishment display*
(Author)

In the plan for revitalising and changing the original building (circa 1930's) to a higher specification, which improved on the poor performance and inflexible arrangements of its earlier construction; it now acts as a showplace and exemplar for the City of New York and the refurbishment and redevelopment of cities round the world.

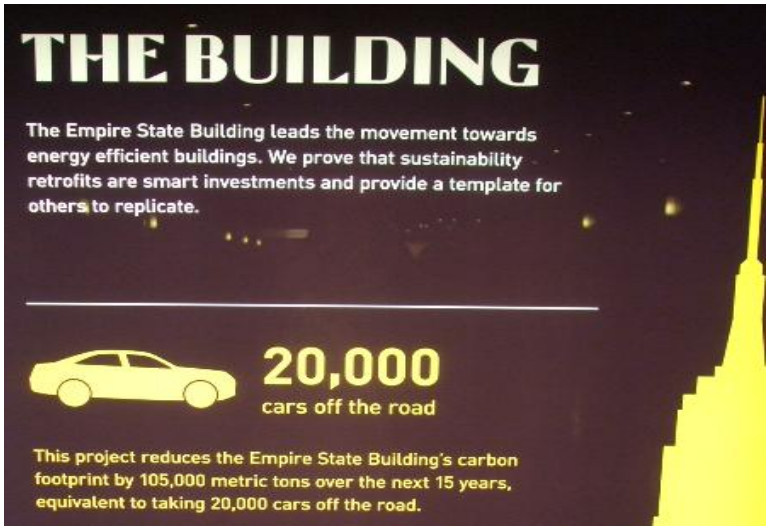

Figure 5-13 *ESB efficiency gains*

(Author)

Many schools are in need of refurbishment for a variety of reasons and this appears as an example of what is possible and provides tangible and intangible returns and rewards.

The extensive and expensive refurbishment of a high profile building in the United States of America (USA) may seem in marked contrast to a secondary school in England. However the finances involved in some of the individual UK secondary school rebuilds has involved investments in the tens of millions of pounds, and the total secondary school rebuild budget was in the order of several billion pounds for the span of the BSF programme (Department for Children Schools and Families 2008).

Some schools were built with a large investment of funds to represent exemplar case studies for the BSF programme. There are several UK school case studies used as exemplars of sustainability provision, which is provided through the Ofsted Good Practice examples (Ofsted 2012). These exemplars are used to address the next question which looks at the comparative reporting of sustainability information.

The following are overviews of the exemplar schools with a selection of the main features that have placed them in this characterisation.

5.4.1 The Long Eaton School (Academy) East Midlands Region

The Long Eaton School has shown a concern for the environment and in 1997 applied for Eco-School status to strengthen the ethos of the school. They set up an Eco Committee for each student year group with links to the school council.

The school has initiated projects relating to energy and water, purchasing and waste, travel and traffic and inclusion and participation. The school grounds play a role with a sensory garden, including a central water feature (designed with the Eco Committee) for the use of students in geography, science and art and the wider community. In 2012 the school gained Ambassador status, which means that it has successfully completed tasks for the nine topics, including energy and sustainability in the curriculum and also provides support with advice and information for other schools (Eco-Schools 2012).

5.4.2 Ringmer Community College (Academy)

Ringmer is a lead National Sustainable Academy with specialisms in Technology and the Arts. There is a direct link to an Eco Section on their website, where there is Eco News and links to the Eco Code which contains information for each classroom on recycling and minimising energy waste. The installation of solar electric panels provides 10% of electrical use, and the new 6th Form building has a ground-source heat pump

which provides 35% of the energy requirements for heating the building. The college encourages involvement of pupils in ‘Ecoprojects’, having achieved over 200 eco-representatives, which is 25% of the school pupils (Ringmer Community College 2012).

5.4.3 St Christopher’s School (Private) South East Region

This school was established in the 1920’s as part of a Quaker group movement for education and has maintained an ethos of peaceful, meaningful learning. The campus life is kept informal as well as productive, where the effort is made providing lessons that are exciting, and results that are stated to be excellent. “We’re studious, creative, musical and active.” They encourage outward-looking values with involvement in the local community and strong links to other countries with development work around the world. In the area of healthy eating the school has always maintained a tradition that is 100% vegetarian in keeping with their principles. The school has Eco-school status, composts food waste from the kitchens and maintains an eco-group with a newsletter, “Environment Matters” (St Christophers School 2012), showcasing events and achievements (Palmer 2011).

5.4.4 The Academy of St Francis of Assisi

This school is the first academy in England with environment and sustainability as its specialism. In 2011 St Francis of Assisi was awarded the International School Award, Green Flag Award and Sustainable School of the Year Award. This example shows the success of an integrated whole-academy approach to address these issues. The buildings are used in the curriculum, as the Solar Atrium provides light and warmth to the building. The atrium, made of inflated ETFE plastic, and angled at 70 degrees, also reflects the heat of the summer sun. The sunlight is also used to produce about 5% of the schools electricity consumption. A public digital display shows the amount of electricity generated and the amount of carbon dioxide saved (The Academy of St Francis of Assisi 2012).

5.5 Conclusion

The data that has been captured, accessed, and evaluated is a snapshot of activities and events that are recorded by schools and their local authorities. The issue can be to have systems available that allow the collection of information through a common input interface such as a webpage. This could then be output automatically as part of the

general reporting back process through database systems and online web interfaces (as some schools provide with their energy and water data (Stuart, Fleming et al. 2005).

This data has been compared to a few selected exemplar case studies of schools noted for their sustainability ethos and values. From the analysis of the data related to these exemplars and the original research questions, there is a comparative advantage to the exemplar schools in their reporting of sustainability initiatives. However none of the schools sampled could be seen to have provided or attempted a comprehensive analysis of their operations and activities related to sustainability, although as noted all the exemplars had webpages and links to some of their environmental and sustainability information.

There is further work required to assess this format of data usage; some of this work is elaborated in further research questions which are raised as part of the results of this study and these are outlined in the next chapter. Also further discussion and analysis of the main findings from the data is noted in the next chapter.

Chapter 6 Discussion

6 Introduction

In this chapter there is analysis and discussion of the range of data presented in Chapter 5. The basis of the theoretical frameworks that were developed, and the literature reviewed in Chapters 2 and 3, provides the background and context for the discussion of the results.

As has been noted by the centre founded by Fritjof Capra:(Center for Ecoliteracy 2012)

> When the entire school adopts a goal to be more sustainable, it models sustainability as a community practice. It shows students that this goal is worth the effort and time, and it demonstrates that a community working together can make a significant difference in the world (para 2).

The data from the schools has been presented to justify the initial research questions and to identify some important findings through selected techniques and methodologies. This chapter will assess the areas covered in the research and provide analysis of the implications from the findings.

6.1 School Background

The schools selected for analysis all had undertaken some outreach and industry interaction as part of their specialist science status. Their status was unaffected at the time of the study.

As noted previously in Chapter 6, the Ofsted website provides a facility for parents and caregivers to make comments under twelve headings about a particular school. These comments can then be viewed by anyone who searches for the school via the Parent View site (Department for Education 2012). This type of collection and disclosure of information could be used as a format for more information to be gathered and presented in one place about the operation and achievement of the educational establishment (Department for Education 2012).

6.1.1 Use of data

There is a discussion in the literature on the validity of using some school data from the DfE database as it may not fully reflect the schools standing and may be misinterpreted and misused in making assumptions and analysis from this output. In this research the main concern is the availability and presentation of information in a format and outlet that is accessible to the public to provide as wide-reaching a view of a school as possible.

From the standpoint of the stakeholder theory, the theoretical framework has limitations in that, while there is a desire for information to be provided there may be a constraint were limited resources are made available to provide information in the necessary and required format from the educational institutions. One aspect of this could be alleviated through the automation of much of the release of data as it is provided through database systems although there can be the accompanying issues of privacy, secrecy, reliability and accuracy (Cormier and Magnan 2004).

6.1.2 Energy and Water

The range of results from the data available through the DECs for each school was similar in profile to the general secondary school population in England (as shown in the energy data tables and figures). Also shown in the figures, there is a tendency for the buildings to be mainly in the range of classification “C” or less. With the emphasis on energy availability and price changes there is much that can be done to improve awareness, reduce consumption and provide alternative power systems (1010global 2012).

6.1.3 Eco-Schools

As noted in the figures, the science schools all show a wide ranging variation in the consumption of water; comparing this with the numbers of students on site and making comparisons with the benchmarks available (Carbon Trust 2005), it can be seen that there is some effort required to improve these results.

However it is necessary to gain more insight into the reasons for the schools having above average water consumption. This could be due to greater use of facilities from the type of catering, differences in the curriculum and after-school community use, and may be differentiating a school from the normal operating parameters.

6.2 Keyword Content and Websites

The keywords were adjusted from different iterations and selections from the range of documents selected. It is apparent that as this was a first appraisal of the websites for a selected group there could be more efficient and reliable explorations made of the websites. Some authors and sites (Cormier and Magnan 2004, Isenmann, Bey et al. 2007, Zavrl 2012) have discussed the use of programmes to automate the collection of data and these are similar to web search engines and data-mining robots which could provide a richer assessment of the websites.

The data for the keywords was presented in a tabulated and graphical format to clearly and easily disseminate the results and provide a basis for discussion of the material. It was noted that the exemplar schools were all shown to have achieved a threshold of at least 100 keyword hits for the sustainability activities or measures used for the schools' analysis. Some of these keywords would have been repeats of the same measure although the general pattern was that this still showed a higher level of web presence for these particular schools when compared to the science ones.

6.3 Case Study Comparisons

The selected case studies are a small sample of exemplar schools which were identified through a range of groups and publications (Department for Children Schools and Families 2010, Eco-Schools 2012, Ofsted 2012). This small sample does produce some issues of how accurate the results and analysis can be which is undertaken on the data. However there is sufficient information from these exemplars to relate to the science specialist group.

6.4 Lessons learnt

The information provided from this study is a minor incursion into the use of the web for the disclosure and reporting of school-based information. The amount of information which is generated from a range of different sources and is now made available for the public and schools to access and use, is impressive and growing.

There is only going to be increased pressure on the schools for financial improvement in performance as well as academic achievement. There are changes in policy and legislation which is providing large corporations incentives to report more than just

financial accounts, similar action is already impacting on schools, through LA adherence to CRC pressures and financial requirements.

The availability of web resources from a range of different devices which provides people, the school stakeholders, to be able to access the internet at any time from almost any place, locally or even globally will be seen as a new challenge and opportunity to connect and interact with a wider and more discerning audience. This also develops a rich environment of opportunity for global development studies and beneficial exchange of meaningful data on a range of sustainability areas with diverse groups. This can provide a new element to the school programme and enrich the curriculum with real data and results which have direct relevance to the immediate stakeholders, the pupils and teachers.

6.5 Conclusion

An overall assumption that is possible to assert is that the amount of information provided on sustainability activities analysed from the websites is still relatively low for the majority of science specialist schools when compared to the exemplars. This may possibly be symptomatic of the pressures on all the schools to meet more immediate and challenging issues and concerns. However it would be expected that some of the science schools would have developed up their curriculum and activities and these would include more sustainability-type measures with the topicality of the subject area.

From the range of results and the variance in some of the data on energy use, water consumption and building operations, this provides an indication of the scope of costs and resources involved in a school that may provide measures for a reporting regime.

The availability of data needs to read within a wide variance in the circumstances of the different schools and the data presented here is a small snapshot from a selected sample that may not be a representative population for this level of study. More analysis and wider sampling may give greater surety to some of the results – however it is clear: that there is: the availability of sufficient information; the availability of the medium of communication, and the necessity for action is growing in importance for many important and crucial reasons.

Chapter 7 Conclusion and Recommendations

7 Introduction

In this chapter the conclusions, recommendations, and contribution to knowledge with areas of further research, are presented. The strengths and scope of the investigation are noted, as well as the validity, omissions and limitations of this investigation.

In a report by the Royal Society for the encouragement of Arts, Manufactures and Commerce it is noted that, “schools are vital to developing the citizens modern Britain needs.” (Francis 2011, p2). The role of education as an exemplar for the direction and future for society can be a powerful and important driver for change.

There is a level of urgency amongst many practitioners and academics to find ways to meet the needs of humanity and to find a level of interaction for humans within their surroundings; which allows continual replenishment and ameliorates any aspect of environmental degradation and catastrophic consequences (Upham 2000). It has been stated that ‘physics trumps economics’; emphasising the contrasting dilemma of the reality of finite resources and earth-systems and eco-services, with the economic and financial growth scenario of capitalist systems whereas the notion of infinite availability of finite resources is seen as a fantasy (Berry 1990).

Sustainability as a framework, assists in understanding a complex concept, as a guide to our place in the world, it can be a useful tool to assess the resilience and adaptability of a school, its community and the surrounding society.

Using a systems approach, which incorporates the four capitals model, provides a strong understanding of the importance of interdependence between natural resource use, human activity and the need for activity levels which match the earth’s resource capacity for sustainable lifestyles.

There are a range of systems and indicators that can be utilised to assess and measure the levels of interaction and achievement in any system, be it an individual, a school or community. The different groups and organisations that interact with schools have

developed a series of measures for their own purposes and to provide an appropriate level of action towards some sense of sustainability.

This research has raised the issue of how schools could improve their performance and reporting of sustainability activities to their stakeholder community. It has touched on the issues of changes in school operations and administration, with the changes in technology and expectations of the public in general and in particular the involvement of the local community.

Websites are used as a medium for dissemination and can be part of a strategy to engage stakeholders by providing accessible information and reporting the achievements of the schools' sustainability efforts locally and beyond.

Gaining a wider recognition, allowing interaction and comment, and sharing of new activities and development in partnership with other stakeholders, is a primary function of improved access and interactivity. There is a need for networking and sharing practice and activities to involve as many participants as possible in achieving goals.

The issue of accountability and transparency will need to be tempered by the role of education to nurture and support upcoming generations. This will require a framework that, while noting performance, will also be reliant on the schools integral part in a community to provide direction through exemplar status.

The role of education has had a mixed importance in history although the education system has always managed to adjust and reform as required to meet the challenges in changing societies and the surroundings. There is increased importance for schools, in an increasingly complex society, where many people in the community spend much time and effort, and this provides a large input into their life awareness. This suggests that schools have a strong developmental role to lead, and extol virtues that are required for future generations.

Where there has been a change in the operation and structure of schools there is a need for greater accountability and transparency, and for the community of stakeholders, this becomes much more important.

The use of electronic media and the growth of internet systems and web-based interactions has seen most schools with a web-presence and this is used as a means of

disseminating and reporting information to the public and interested parties, such as the local stakeholders.

The curriculum in schools can be a powerful medium for creating awareness and testing knowledge and skills. The science-based subjects all have a part to play in disseminating information on sustainability as do all other curriculum subjects. The role of science education is to bring rigour to the study of the natural environment, while providing the opportunity to debate and provide solutions to challenges.

7.1 Conclusions

The sample population of secondary science schools in this study has given a representative overview that has compared well with the characteristics of other schools based on the PISA data from the OECD countries (Organisation for Economic Co-operation and Development 2011).

7.1.1 Schools in England

Science schools

Science education, if at the forefront of the sustainability debate, would be based on current knowledge presented by authoritative groups such as the Intergovernmental Panel on Climate Change (IPCC), and United Nations Environment Programme (UNEP). This is an area of importance for future generations and the IPCC is a scientific body which reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide to assess current understanding of climate change. IPCC embodies a unique opportunity to provide rigorous and balanced scientific information to decision makers.

7.2 Recommendations

From the literature it is apparent that many businesses, NGOs and other organisations, such as educational institutions at the university level, are engaging with the need to provide accountability and transparency for their operational activities, including sustainability. For schools there is an increasing urgency to provide details of the operation of the institution to the local community with these stakeholders requiring more details of the school's information to make their appraisals.

Currently there is information on the attributes of schools that is obtained on their examination performance and their financial details, which are available through the UK Department for Education website (Department for Education 2011). This data could be made more readily available to provide greater transparency and accountability for incorporation into the schools' own sustainability and social responsibility report.

The initiative by the EC to have EMAS available as a global version allows for the uptake of a similar expanded version of CSR reporting for schools to be implemented in the regions of England, the UK, Europe and World-wide (European Commission 2012).

There are many examples of 'lost opportunities' where schools are involved in activities that have an influence on sustainability issues and they are only obliquely mentioned or briefly when they could have presented much more information to inform pupils, the local community and the general public.

7.2.1 Policy issues

There is a need to provide a networking and sharing practice of achievements, to involve as many participants as possible both locally and globally.

Local Authorities need to provide shared resources and support for stakeholder interaction with information on community-wide sustainability activities and links to help connect within and beyond the area and lead by example providing web technology and network support.

Policymakers could develop a framework and use reporting in a whole-school approach to drive environmental sustainability to a high status level so that it is embedded in the fabric of schools and local authorities operations.

7.2.2 Management and reporting

Governments need to take into account the use of EMAS or a similar scheme to augment with the Ofsted reporting as part of a drive for improvement and sustainability measures as noted by the Sustainable development in learning and skills inspections - Guidance for inspectors (Ofsted 2012) (key actions in the building and estates areas). The use of Corporate Social Responsibility (CSR) is also linked to sustainable development, where the reporting purports to show the extent a company has met its

obligations to ensure the most environment friendly operations are encouraged to allow it to sustain its relationship with people and the environment for the future.

Other reporting systems are also important to evaluate for their effectiveness. The utilisation of a version of EMAS would be an option as it is supported by the EC and is accredited by assessors which could be in a similar way to current Ofsted provision. Leicester City through the Groundwork Trust, has over 80 schools accredited with EMAS and the benefits are noted in a report by the EC EMAS study on costs and benefits and through the Groundwork Network (Groundwork East Midlands 2011, European Commission 2012).

The concept of a version of the EMS ISO 14001 needs to be investigated to provide for an adequate management system – resources from groups like The Sustainable Schools Collaborative, Oregon may be useful (European Commission 2012, The Sustainable Schools Collaborative 2012).

Elements of the Eco-school approach to sustainability assessment could also be incorporated into integrated sustainability reporting that could be made available for schools. All the schools have websites, and interaction with the schools is undertaken through this medium so that stakeholders locally should be able to gain easy access to the available information on the operation of the school in a range of areas and facets.

7.2.3 Websites

The increasing access by the public to the web and increased level of interest in sustainability has given rise to a demand for increased disclosure. Websites need to be seen as an important communication medium and part of a strategy to engage stakeholders by providing information and disseminating the achievements of schools' sustainability efforts locally and beyond.

There is a need to look at all school websites reaching a standard with a level of comparability using similar terms and hierarchies in their online structure. Some websites have a site map, and the use of a separate tab or series of pages for sustainability would be an important and useful feature.

The is a need to have an easily navigable website and the use of a tab or link to a sustainability page/s would appear to be a fundamental starting point to ensure

accountability through openness and transparency to the work of the school in their curriculum, campus and community activities. Easy access to the energy and water data through a link to their DEC records is also possible.

There is no indication if any schools have managed to implement these types of suggestions and how effective this may be. It would be good if the ESP had a template to allow the schools to easily create a webpage to showcase their school achievements. Some schools have achieved this, although as is seen in the data analysis these are low in numbers out of the sample population for this study.

Schools need to use websites as powerful reporting and dissemination medium with a range of tools and techniques to engage stakeholders, allow interaction and comment and opportunities for cooperation and networking.

The websites need to gain wider recognition as a tool to allow interaction and comment and the sharing of activities and the development of new activities in partnership with other stakeholders.

7.3 Further research

The implications for a global roll-out of the EC system would be a major topic for further study and research to chart the impact of improved performance reporting in many attributes of education to provide evidence of the system sustainability of educational institutions.

Other areas for possible study are listed below:

- the effect the implementation of new initiatives in the way of special school status or building programmes affect the perceived sustainability of the school
- new reporting from Ofsted may categorise changes in the sustainability of schools
- a school reporting its achievements annually or when reaching a particular level of sustainability
- recent initiatives to change school structures suggest different reporting methods are required

From the research it is clear that schools need to provide more disclosure and that Academies, Free Schools and other schooling options may need to be the subject of further research to see to what extent they fulfil the requirements for transparency and accountability. An interview process may be required to understand the factors that influenced (or not) the level of disclosure on the websites.

7.3.1 Additional Questions

Does a systems approach provide a clear definition of a sustainable educational institution?
Can a school be expected to provide a CSR style report?
Could the CSR style report be based on material that is similar to Ofsted inspections?
Can the measures to make more schools independent academies become a driver for the CSR style report to assure communities of the transparency and accountability of the new school management and structures?
Can the science specialism of schools be used to generate exemplar schools for sustainable development?
How are the selected schools reporting any achievements in reaching a particular level of sustainability?

7.4 Concluding Remarks

While science and other STEM subjects are all strong participants in the drive for greater awareness amongst pupils and staff, there is a need for sustainable practise in all aspects of a school; from teaching and learning practise, to the operation and management changes required, towards greater action for sustainability. This is not seen as a prerequisite, as all the other curriculum areas can be equally involved in orientating their topics and subject matter to reflect the desire for a sustainable future, while maintaining an integrity to meet the requirements for excellent learning outcomes for the primary outcome, of providing good citizens through good educational standards in schools.

The adoption of a reporting system is necessary to encompass the myriad of activities in which secondary schools are involved. The use of a form of IR in the style of an EMAS and CSR approach, with the incorporation of the annual financial accounts, would make for a more systematic move towards the concept of reporting for transparency and accountability, as an integrated whole-school approach for sustainable operation.

Schools need to be at the vanguard of sustainability reporting using the latest technology and making the most potential of their online presence to stakeholders in the local community and a presence at the regional and national level.

It can be noted that the idea of sustainability in schools could more easily be implemented by using an adaptation of the eight ‘doorways’ framework in a systemic way as the basis for the measures. It is useful to be disclosing a school’s sustainability credentials to a wider public audience and showing an engagement with the challenge to educate, and inform while also being seen to educate the future generations. This is one of the most important challenges and opportunities available to society today.

Figure 7-1, which is presented below, has been developed from the diagrams which are noted in the literature to represent aspects of sustainability and environment linked with society and its functions. It attempts to provide a concise overview of the research parameters and notes some of the drivers to develop a reporting system for sustainability. Some of the outputs from such a regime could be incorporated in educational institutions’ websites to improve their presence on the internet, providing IR with transparency and accountability to their stakeholders; an important area for the practice of sustainability.

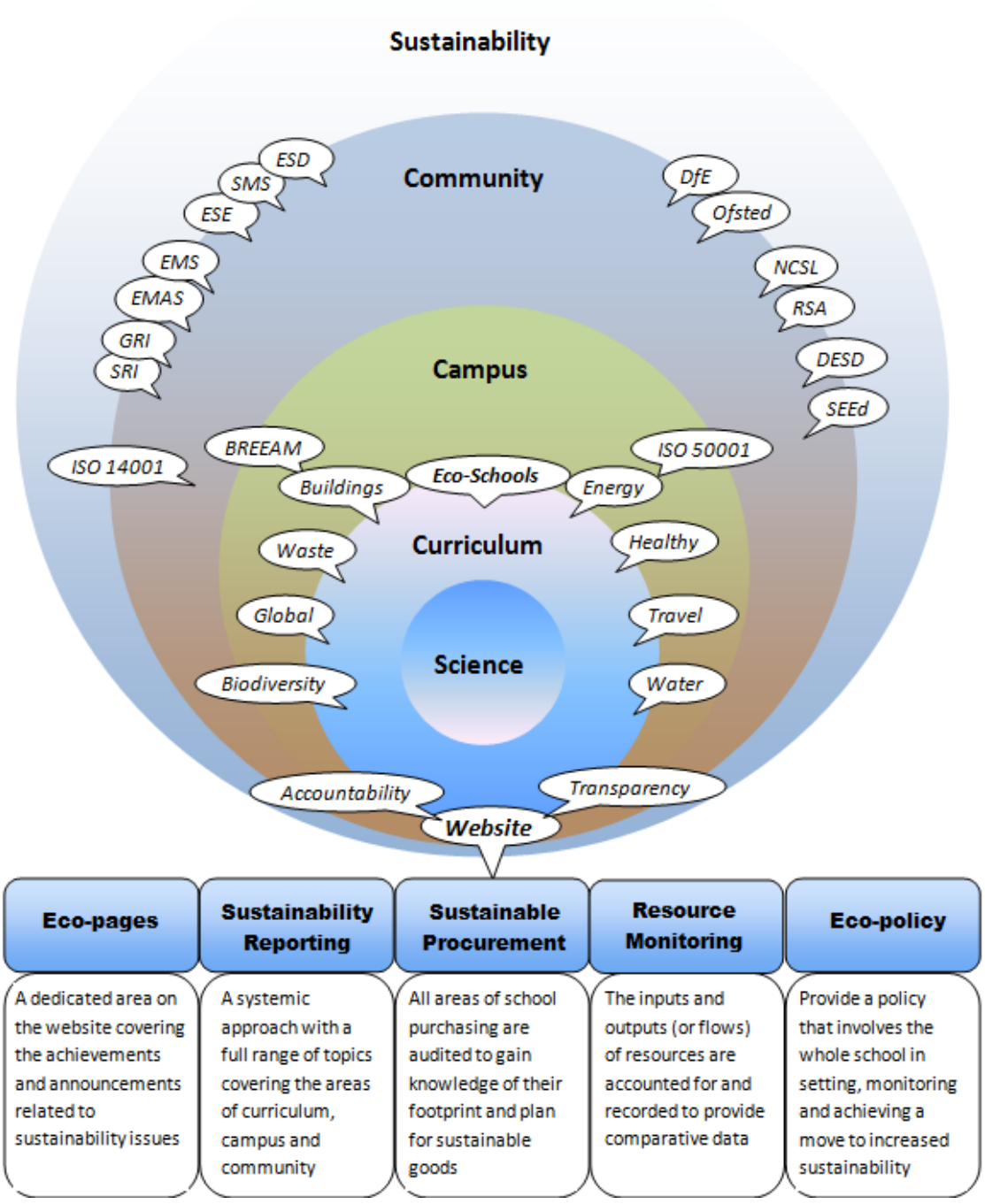

Figure 7-1 Summary of the systemic sustainability reporting envisioned for schools (Author)

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Appendix A Higher Education Sustainability Initiative for Rio+20

United Nations Commitment to the Sustainable Practices of Higher Education Institutions Initiative

DECLARATION

"As Chancellors, Presidents, Rectors, Deans and Leaders of Higher Education Institutions and related organizations, we acknowledge the responsibility that we bear in the international pursuit of sustainable development. On the occasion of the United Nations Conference on Sustainable Development, held in Rio de Janeiro from 20-22 June 2012, we agree to support the following actions:

- ***Teach sustainable development concepts**, ensuring that they form a part of the core curriculum across all disciplines so that future higher education graduates develop skills necessary to enter sustainable development workforces and have an explicit understanding of how to achieve a society that values people, the planet and profits in a manner that respects the finite resource boundaries of the earth. Higher Education Institutions are also encouraged to provide sustainability training to professionals and practitioners;*
- ***Encourage research on sustainable development issues**, to improve scientific understanding through exchanges of scientific and technological knowledge, enhancing the development, adaptation, diffusion and transfer of knowledge, including new and innovative technologies.*
- ***Green our campuses** by: i) reducing the environmental footprint through energy, water and material resource efficiencies in our buildings and facilities; ii) adopting sustainable procurement practices in our supply chains and catering services; iii) providing sustainable mobility options for students and faculty; iv) adopting effective programmes for waste minimization, recycling and reuse, and v) encouraging more sustainable lifestyles.*
- ***Support sustainability efforts** in the communities in which we reside, working with local authorities and civil society to foster more liveable, resource-efficient communities that are socially inclusive and have small environmental footprints.*
- ***Engage with and share results through international frameworks**, such as the UN Decade of Education for Sustainable Development, led by UNESCO, the UN University system, the UN Academic Impact, the Global Compact, the UN-supported Principles for Responsible Management Education initiative and the UN Environment Programme's Environmental Education and Training initiatives, in order to exchange knowledge and experiences and to report regularly on progress and challenges."*

(United Nations 2012)

Appendix B Four Capitals

Human capital – where the knowledge, skills, health and fitness of people are important; they need to be showing a relevance to achieving a sustainable world where resources are scarcer while human population is increasing.

Natural capital – the resources of the planet are consumed; from air, water, food, fuels (fossil and renewable), and minerals, to the discharge of pollutants into the air, waters and land. These are also known as the natural services that our planet provides.

Physical capital – the product of the transformation of the natural resources using the human resources. It is the buildings, the roads, appliances, clothes etc that we use more and more of each year. The type of physical capital that is created will be important if it is to be relevant in a sustainable society.

Social capital – here we are looking at the extent that people are members of a family, the links to neighbours and the community – these can be based on the distance that families live from the school they attend, the involvement of the school with the parents and the wider community.

(Ekins 1992)

Four Capitals

If we can't use the market, how can we know if we are moving our system toward greater sustainability? The answer is through the use of indicators. A technique was advanced by Paul Ekins, termed the "Four Capitals" approach to sustainability. This approach sets out that the life that we live, the benefits that we enjoy, are as a result of our living on the income from four different types of capital.

Natural capital

The first, but you can't say the most important for reasons I'll explain, is natural capital, natural resource capital. A recent book "Natural Capitalism" [by Paul Hawken] is all about this area. We enjoy a stream of benefits from the natural world. It provides our food, raw materials, renewable and fossil energy. It provides sinks for our wastes so that it makes them harmless and they re-enter the system. There are also benefits from its biodiversity and its natural beauty. We couldn't possibly survive without the natural world. So that's one form of capital which generates an income that meets some of our needs. But we also get benefits from three other areas.

Social capital

The second is social capital. Again this is an idea which is becoming very popular at the moment. Social capital is the source of the stream of benefits that you receive from being a member of a family, from having neighbours, from being a member of a community, having a network of friends. And also belonging to a country, because one's national identity and the support you get from that is important to you. One of the things therefore that we need to provide indicators for is the strength of community bonds - are they being undermined? You could look at all sorts of things to gauge this. For example, there is a correlation between the amount of time somebody spends commuting to work and the amount of time that is consequently left in which they can interact with others. One of the figures I've seen is that a 10 minute increase in commuting time

means that there is roughly a 10% reduction in the amount of time that people have to interact with their neighbours and other members of their community. Television has to some extent weakened community bonds. Are people joining clubs and societies and interacting in those ways? Are neighbours as supportive as they once were? So that's another form of capital, social capital.

Human capital

The third form of capital is human capital. And that's primarily our health and strength, our vitality. Are we fit, mentally and physically, or are we degenerating? And it's also our knowledge and skills and dexterity, you also have to look at some areas where skills are being lost - for example traditional craft skills and knowledge. So in some areas we are gaining and in some we are losing. You have to be able to assess a balance between losses and gains. What you are really looking for are skills which would be of relevance in a sustainable world, in a world where you weren't using natural resource capital in an unsustainable way as we are at the moment.

Physical capital

Finally, you've got physical capital. This room, the chairs within it, the cars outside, the building itself, tools and equipment and so on, all represent physical capital. We are increasing our physical capital in this country each year. But again we have to ask the question, are we increasing the types of physical capital that would be relevant in a truly sustainable situation? The Government is spending many millions of pounds on developing a road network, yet if we are coming to a peak in oil are we going to be able to have the capital, the natural resource capital, to operate vehicles on the new road system in the future? Are we going to have the income to be able to operate those vehicles?

Appendix C Ofsted's key areas for sustainable schools

Management *– focusing on the school mission statement; ESD policy statement; senior management involvement and support; references in the school development plan; allocation of resources; role of the governing body; guidance on implementation into the curriculum; relevant professional development; ESD audit; monitoring of ESD; the sustainability of ESD projects*

Curriculum *– focusing on planning; inclusion and identification within current schemes of work and lesson planning; evidence of cross-curricular mapping*

Teaching *– focusing on positive role models; use of local case studies; engaging local issues; links with, and use of, ESD associations; use of topicality; active learning; exploring issues leading to action on behalf of pupils; evidence in displays of work, for example, letters to decision makers; global links; field visits*

Learning *– focusing on independent styles of learning; children developing their own reasoned points of view; pupils as active citizens within the classroom, school and community; active participation in reducing waste; active decision-making*

Decision-making *– focusing on active involvement in a school or eco-council; examples of whole school participation and co-operation; playground committee; active environmental group; networking and community involvement; fundraising; feedback mechanisms for students to talk about school issues; pupil-parent-teacher working groups*

Specific projects *– focusing on details of specific initiatives that the school may be involved in; links with NGOs or other areas of funding/support; details of each project context, funding, success indicators*

General environmental indicators *– focusing on an eco-code; waste minimisation and recycling schemes managed by pupils; incentives and schemes in place for staff and pupils, e.g. to travel by means other than by car*

Purchasing *– focusing on recycled paper; fair trade products; fresh food on offer; local produce sourcing policy; environmentally friendly purchasing throughout the school; energy efficiency measures in place; pupils' involvement in purchasing policy*

Grounds and learning environment *– focusing on the use of school grounds and facilities; wildlife garden; use and upkeep of green space; nature set-aside; recycling facilities; use of school grounds for teaching and enhancing the taught curriculum; diversification of school buildings and grounds outside school hours, for example for community education.*

(Ofsted 2003)

Appendix D Eight Doorways for Sustainability

For the eight 'doorways' these opportunities and recommendations are:

1. ***Food and drink –*** *By 2020 the government would like all schools to be offering and promoting healthy, local and sustainable food and drink, produced on site (where possible), with strong commitments to the environment, social responsibility and animal welfare, and with increased opportunity to involve local suppliers. A school that buys healthy, ethically sourced food can offer nutritional benefits; improve pupils' understanding of food and where it comes from; protect the environment and support local producers and suppliers.*

2. ***Energy and water*** *– By 2020 the government would like all schools to have minimised their carbon emissions by becoming exemplars of energy efficiency and renewable energy, showcasing wind, solar, bio-fuel and other appropriate energy sources in their communities. Furthermore, we would like all schools to have minimised their use of freshwater by becoming exemplars of sustainable water management, showcasing freshwater conservation, rainwater use, and other water conservation measures in their communities. Sustainable Schools can showcase energy efficiency, renewable energy use and water conservation to pupils and the whole community. Eco-efficiency measures can help schools reduce their environmental impact.*

3. ***Travel and traffic*** *– By 2020 the government would like all schools to be models of sustainable travel where vehicles are used only when absolutely necessary and facilities for healthier, less polluting or less dangerous modes of transport are exemplary. Car sharing and public transport can help with congestion and pollution; while walking or cycling boost fitness, increase concentration and help children form positive habits for life.*

4. ***Purchasing and waste*** *– By 2020 the government would like all schools to be models of resource efficiency by using low impact goods from local suppliers that minimise (or eliminate) packaging and that are produced with high environmental and ethical standards, and by recycling, repairing and reusing as much as possible. By adopting a 'reduce, reuse and recycle' approach, and by using local goods and services of high environmental standards, schools can reduce costs and support ethical markets in their communities.*

5. ***Buildings and grounds*** *– By 2020 the government would like all schools buildings and grounds to be regarded as living, learning places where pupils see what a sustainable lifestyle means through their involvement in the continual improvement of the school estate. Sustainable design principles, technologies, interior furnishings and environmental management not only bring physical benefits for a school, they provide working examples of sustainable living that can inspire teachers and children.*

6. ***Inclusion and participation*** *– By 2020 the government would like all schools to be acting as models of social inclusion, enabling all pupils to participate fully in school life while instilling a long-lasting respect for human rights, freedoms and creative expression. Schools can promote community cohesion by creating an inclusive, welcoming atmosphere that values everyone's participation and contribution, and challenges prejudice and injustice. Pupils are instilled with a long-lasting respect for human rights, freedoms, cultures and creative expression.*

7. ***Local well-being*** *– By 2020 the government would like all schools to be models of good corporate citizenship within their local areas, enriching their educational mission with active support for the well-being of the local environment and community. With their central locations, facilities and extensive networks schools can act as hubs of learning and catalysts for change in their local communities. Focusing on local challenges and finding solutions to them gives pupils the opportunity to learn and develop real-world skills and helps to strengthen local relationships.*

8. ***Global dimension*** *– By 2020 the government would like all schools to be models of good global citizenship, enriching their educational mission with active support for the well-being of the global environment and community. Growing interdependence between countries changes the way we view our world, including our own culture. Schools can respond by developing a responsible, international outlook among their pupils on global challenges such as poverty and climate change.*

   (Department for Children Schools and Families 2008)

Appendix E The Five Capitals

There are five types of sustainable capital from where we derive the goods and services we need to improve the quality of our lives.

Natural Capital is any stock or flow of energy and material that produces goods and services. It includes:

- Resources - renewable and non-renewable materials
- Sinks - that absorb, neutralise or recycle wastes
- Processes - such as climate regulation

Natural capital is the basis not only of production but of life itself!

Human Capital consists of people's health, knowledge, skills and motivation. All these things are needed for productive work.

Enhancing human capital through education and training is central to a flourishing economy.

Social Capital concerns the institutions that help us maintain and develop human capital in partnership with others; e.g. families, communities, businesses, trade unions, schools, and voluntary organisations.

Manufactured Capital comprises material goods or fixed assets which contribute to the production process rather than being the output itself – e.g. tools, machines and buildings.

Financial Capital plays an important role in our economy, enabling the other types of Capital to be owned and traded. But unlike the other types, it has no real value itself but is representative of natural, human, social or manufactured capital; e.g. shares, bonds or banknotes.

(Forum for the Future 2011)

Appendix F The Twelve Features of a sustainable society

By describing what a sustainable society should look like, the ‘12 features’ model helps organisations evaluate the sustainability of their projects.

The features fit into the separate five capitals. If we invest appropriately in all capital stocks, and achieve the flow of benefits, the following statements would be true. They represent the outcome of a successful capital investment strategy for sustainable development - that is, a sustainable society.

of Natural Capital

- In their extraction and use, substances taken from the earth do not exceed the environment's capacity to disperse, absorb, recycle or otherwise neutralise their harmful effects (to humans and/or the environment)
- In their manufacture and use, artificial substances do not exceed the environment's capacity to disperse, absorb, recycle or otherwise neutralise their harmful effects (to humans and/or the environment)
- The capacity of the environment to provide ecological system integrity, biological diversity and productivity is protected or enhanced

of Human Capital

- At all ages, individuals enjoy a high standard of health
- Individuals are adept at relationships and social participation, and throughout life set and achieve high personal standards of their development and learning
- There is access to varied and satisfying opportunities for work, personal creativity, and recreation

of Social Capital

- There are trusted and accessible systems of governance and justice
- Communities and society at large share key positive values and a sense of purpose
- The structures and institutions of society promote stewardship of natural resources and development of people
- Homes, communities and society at large provide safe, supportive living and working environments

of Manufactured Capital

- All infrastructure, technologies and processes make minimum use of natural resources and maximum use of human innovation and skills

of Financial Capital

- Financial capital accurately represents the value of natural, human, social and manufactured capital

(Forum for the Future 2011)

Appendix G Eco-Schools Programme (nine topics)

The nine key environmental topics the ESP is focused around implementing:

- Biodiversity – pupils are encouraged to work in the school grounds and to become aware of the biodiversity issues in the local area and internationally. ESP provides knowledge-based learning and links to the school curriculum, with an emphasis on the benefits to humanity from a range of species in the wild.

- Energy – this is the one topic that is compulsory for schools and is seen as a way to reduce their carbon emissions and energy costs. Schools check utility costs, meters and sources of high energy use in gas, electricity and any other fuel sources. This topic is supported by EDF Energy through 'the Pod' schools programme, to make measurable improvements in the energy use of schools nationwide.

- Global perspectives - seeks to ensure that pupils consider how the environmental, social and economic impacts of the decisions they make on a daily basis, impact on the local and global community – in the future as well as in the present. ESP also links with the Global School Partnerships (GSP) which aims to motivate a commitment to a fairer, more sustainable world.

- Healthy living – the issues of obesity, smoking and bullying are noted, as there is a large amount of time spent in schools, and so it is stated that pupils need to be in a healthy environment to promote their own health and wellbeing, with the principles of caring for oneself, caring for others and caring for the environment. A series of case studies are provided by ESP.

- Litter – it is noted that many schools address litter as one of their first actions after a review. Advice is provided on the steps to implement awareness in the school and links to other campaigns and resources on the topic

- School grounds – advice is proceeded on how to improve school grounds and the reasons for maintaining and using the grounds in learning activities

- Transport – information is provided on some of the issues with cars and the need for alternative travel schemes to school for health, pollution and congestions reasons

- Waste – schools are encouraged to have a waste reduction pledge as part of their action plan. Some statistics on waste and how to reduce it are mentioned with resources for teaching recycling highlighted.

- Water – the issue of clean water is covered, with some background details on water use and an urge to make savings. Schools spend around £106m a year on water. A large secondary school can spend as much as £20,000. Careful water management together with an effective education programme can reduce water use by two-thirds. This could save a school of 600 pupils around £5,000 every year. Schools may address water as part of their Action Plan to reduce water consumption by identifying water use, reducing water use in kitchens and toilets, reducing flow rates on taps, halting leaks and drips, and checking the meter.

(Eco-Schools 2012)

For details of the steps to becoming an eco-school, the process is noted as:

1. Register for Eco-Schools – by completing an online form with general information about the school and provide details of their DEC, noting that: “Schools making a minimum 10% reduction in their energy usage will be eligible for the new Act on CO2 school's award. Schools are required to submit their DEC as part of the Eco-Schools Green Flag application and could be eligible for a new award if they can demonstrate a 10% reduction in energy consumption.”

2. Form an Eco Committee – this will choose the topics the school wishes to address (in addition to energy, which is compulsory)

3. Conduct an Environmental Review - this is undertaken by the committee and informs the Action Plan (recommended to be designed using a template by ESP). This can be as simple as a series of questions (Is the school litter free?) with Yes/No answers. A comparison of the original and annual follow-up review will help plan future environmental strategy.

4. Develop an Action Plan – this is seen as the main core of the Eco-School award at whatever level “Bronze, Silver or Green Flag level, your Action Plan must be shared with the whole school community”. It should list the actions to improve environmental performance with a timeframe and person responsible. All schools with the Green Flag award must provide their DEC details.

Eco-Schools (2012)

Appendix H Environmental Management Assessment System (EMAS)

Distinctive key elements of performance, credibility and transparency

Organisations receiving EMAS registration must comply with these steps:

- Conducting an environmental review, where consideration of all environmental aspects of an organisation's activities, products and services, the methods to assess these, relevant legal and regulatory framework and existing environmental management practices and procedures.
- Adopt an environmental policy containing commitment both to comply with all relevant environmental legislation and to achieve continuous improvements in environmental performance.
- Develop an environmental programme that contains information on specific environmental objectives and targets. The environmental programme is a tool to help the organisation in its everyday work when planning and implementing the improvements.
- Based on the results of the review, establish an effective environmental management system (EMS) aimed at achieving the organisation's environmental policy and at improving the environmental performance continually. The management system needs to set responsibilities, means to achieve objectives, operational procedures, training needs, monitoring and communication systems.
- Carry out an environmental audit assessing in particular the management system in place and conformity with the organisation's policy and programme as well as compliance with relevant environmental regulatory requirements.
- Provide an environmental statement of its environmental performance which lays down the results achieved against the environmental objectives and the future steps to be undertaken in order to continuously improve the organisation's environmental performance.
- The environmental review, EMS, audit procedure and the environmental statement must be approved by an accredited environmental verifier. The validated statement needs to be sent to the EMAS Competent Body for registration and made publicly available before an organisation can use the EMAS logo

(European Commission 2012)

Benefits identified with EMAS include increased efficiency savings; reduction in negative incidents; and improvement in stakeholder relationships (European Commission 2012).

A range of benefits for schools from implementing an environmental management system:

- Financial savings through a reduction in resource use and waste production. The scheme encourages reducing the use of resources in school, such as heating and lighting, this ultimately cuts site costs.
- Curriculum enrichment. Groundwork will take care to ensure that activities undertaken as part of EMAS will be tied into most areas of the National Curriculum, including English, Science, Maths, Geography, Art & Design, Citizenship and Information and Communication Technology. The curriculum will be enriched by the relationship that the pupils will develop with the environment. Groundwork can also aid using outside areas for learning, either through delivering sessions or through advice to teachers. Pupils will take part in every stage of the environmental management and audit process, this will give them new experiences and knowledge which can be used in all aspects of learning. It is their chance to get involved in a real-life practical project, which will help them build on written and communication skills.
- Development of ownership and personal and social responsibilities for the school and its environment, among all members of the school community. As well as the opportunities provided for pupils, taking part in the EMAS project also provides numerous opportunities for staff to develop leadership and management skills.
- Involvement with a groundbreaking project. By joining EMAS your school could be among the very first in the country to gain the prestigious European EMAS environmental accreditation and display its logo on letterheads and publicity material.
- Enhancement of your school profile, through verification of a European environmental award. On top of the European status of the EMAS project, the scheme is expected to attract media attention, which would help enhance your school's community profile. Also Ofsted have made very positive comments to schools who have taken the EMAS project on.
- Providing a vehicle for developing community cohesion. The project encourages the involvement of the school's local community at every level. From helping at school open days to tell friends and family about the EMAS work, to helping to work on the development of a nature area.
- Free Tours of the Eco-House (Groundwork's Environmental Show home). EMAS schools have free Eco-House Tours available. The Eco-House offers a fantastic focal point for environmental education, bringing to life many issues concerning how to become more environmentally friendly in our everyday lives.
- Encourages the sharing of ideas and knowledge between schools. The EMAS project, the handbook and this website, encourage the sharing of knowledge between schools who are involved in EMAS. The project also helps facilitate the sharing of funding sources, or ideas that have worked well in other schools.
- EMAS also promotes excellent links and helps support other government agendas such as Healthy Schools, the Learning Outside of the Classroom Manifesto and the Sustainable Schools Agenda

(Eco Management and Audit Scheme 2012)